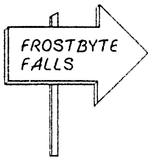
Frostbyte Falls
Apple Computer, Inc. Technical Communications
AppleFax Modem

AppleFax Modem

Shelley Bowers
Product Support Engineer



AppleFax Modem

Overview

The AppleFax Modem was introduced in August 1987. Due development delays, the product will not begin shipping until late March 1988. The Marketing Product Number is M0177; the price will be $699.

The primary use of facsimile has been for transmission of graphics information. The existing and rapidly growing facsimile market, in small to large businesses and the federal government, prodded the development of the AppleFax Modem.

The AppleFax Modem is a low cost, light weight, low profile, high performance desktop communication device. Using an AppleFax modem a host CPU can send and receive imaged documents over a Public Switched Telephone Network to or from Group 2 or Group 3 facsimile machines.

The AppleFax Modem will also function as a high-speed (9600 bps), half duplex modem with built-in error detection for communicating with another AppleFax Modem.

An auxiliary Pass-through port on the AppleFax Modem allows connection of a second serial device. This provides two possible communication modes; only one of which can be used at a time.

The standard serial interface to the host CPU is RS422. AppleTalk is not supported.

The AppleFax Modem includes an external power supply module, much like the Apple IIc. Two versions of the power supply module will be manufactured, one for the US and Canada and the other for Japan. At this time, the modem will only be sold in these countries due to communication regulations in many European countries.

Following will be a brief discussion of facsimile technology, technical information on the AppleFax Modem hardware and firmware, features of the AppleFax software, and compatibility and print quality issues.

Facsimile Technology

What is it?

Facsimile is the process of electrical transmission of printed material over phone lines to a remote location where it is then reproduced once again in printed form. The advantage of facsimile transmission over data transmission appears primarily in the exact reproduction of hard-copy graphics, photographs, signatures, fingerprints, and the like. This ability lends itself to many fields; the facsimile machine is used widely in business, law enforcement, libraries, and weather forecasting.

How Does it Work?

The facsimile process consists of converting visual information to analog electrical signals much the same as a copy machine. These signals modulate a transmitter to be sent to a receiver electrically through the phone system. The receiver converts the received signal to the same type of electrical signal generated at the sending unit; finally the receiver converts the patterns of the signals to a copy of the orignal.

The scanning process and converting a document to electrical signals can be accomplished several ways. Many types of scanning devices are used: rotating cylinder, flatbed, electrical scanning, vertical slit etc. Either a photodiode or a photomultiplier tube is used for conversion of varying light intensity to electrical signals.

Because of the variances of amplitude and frequency in the output from the facsimile scanner, it is necessary to alter the form of the fax signal before it can be sent over lines conditioned for voice transmission. Many methods are used, they are primarily combinations or amplitude modulation, frequency modulation, frequency shift key, sideband and many more. These methods have been extensively defined by industry standards. Other factors which influence the techniques used for transmission are length of the scan line, scan rate (lines per minute), and resolution (lines per inch).

There are also many techniques for converting electrical signal information into visual printed data. The key for facsimile reproduction is that the scanning mechanism at the receiver be synchronized to the scanner at the transmitter.

Hardware Descriptions/Configurations

The AppleFax Modem performs the transmission and receiving functions similar to those of a fax machine. It communicates with another AppleFax Modem using high speed data transmission of Macintosh files or communication with a group 2 or group 3 facsimile machine transmitting fax formatted files.

A scanner would provide for input of non-Macintosh generated documents. All documents received can be printed.

The AppleFax Modem is not able to function in a digital PBX environment without additonal hardware support.

External Hardware

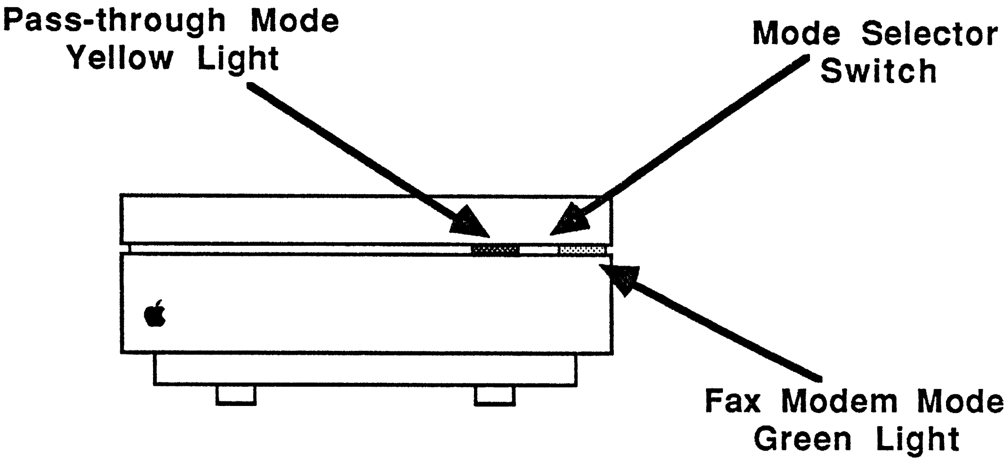


Figure 1: AppleFax Modem Front View

- The Mode Switch selects either the pass-through mode (Yellow LED) or the normal fax mode (Green LED). The two LED's also function as power-on lights.

Side View (Fig. 2)

- A volume control slide switch, on the modem's right hand side, controls the speaker volume. When in the most forward position the modem is at maximum volume. The volume can also be controlled by the firmware.

- Tabs on the right and left sides of the modem hold the top cover in place; push in these tabs with a screw driver to remove the cover.

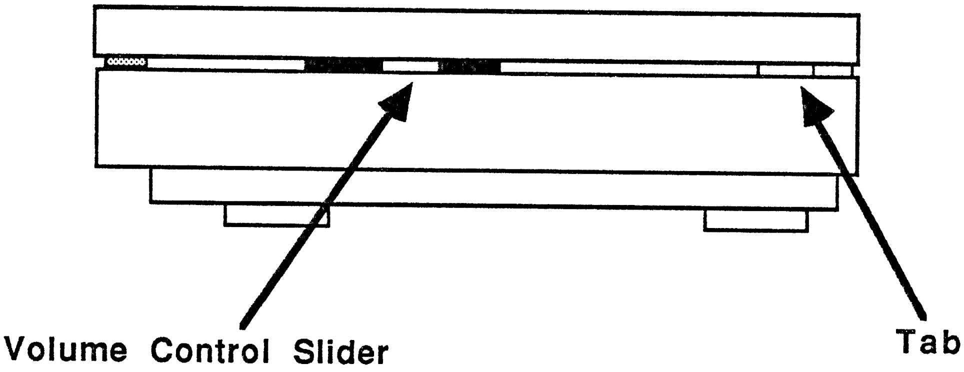


Figure 2: AppleFax Modem Right Side

Back of Modem (Fig. 3)

- The Power On/Off Switch controls low voltage power flow from the external power supply to the AppleFax Modem.

- The two RJ11C phone jacks are for connecting the modem to an external phone line and to an optional telephone set or a general purpose modem. Only lines 2 (ring) and 3 (Tip) are used. The jacks are not interchangeable; only the external phone line jack can detect a ring.

- The two mini-circular 8 connectors are used for RS422 serial interface. These two connectors are not identical in function. Any serial device designed to attach to the Macintosh can be attached to the pass-through connector. The fax modem must be turned on to use the attached device. The AppleFax Modem must be connected to the modem port on the Macintosh CPU.

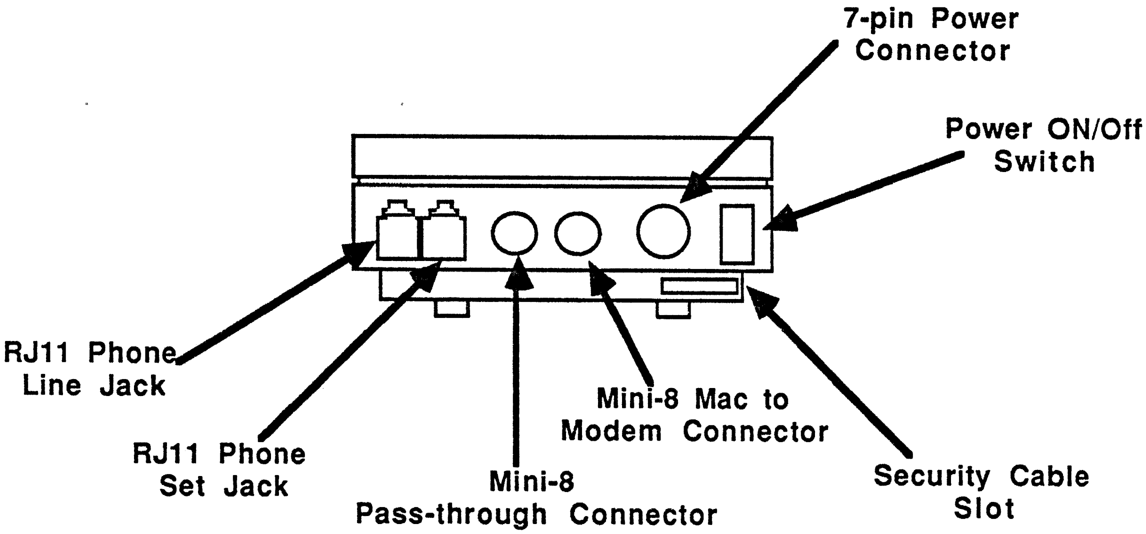


Figure 3: AppleFax Modem Rear View

Functional Overview

All communications between the controlling device and the AppleFax modem follow the RS-422 serial communication protocol. The controlling device sends serial data line by line to the modem. It is converted by the SCC to parallel data which can then be executed by the microprocessor. The data is converted back to serial before being either to the host or out to the fax chip set (data pump). Data received by the data pump is amplified and sent over the phone lines.

A ring detector signals the receiving AppleFax Modem the data is coming over the phone lines. The microprocessor initiates the OFFHOOK signal to close the switches and allow the data to flow into the modem. The received data is amplified before entering the fax data pump. The data is then sent to the SCC for conversion to parallel data before processing by the microprocessor.

Internal Hardware/Processing Logic

- The microprocessor is an 65C112 operating at 1.8432MHz. The processor directs and controls logic flow, decodes and executes commands sent from the host, configures the modem's operating modes, and directs and buffers data between the host, SCC, and the fax chip set.

- RAM is an 8K x 8 chip; it acts primarily as a data buffer, The microprocessor buffers the transmitted data between the host and modem, and uses a portion of the RAM for temporary memory storage.

- The ROM contains the firmware executed by the microprocessor to control the AppleFax Modem; it is a single 32K x 8 IC.

- The 85C30 SCC, Serial Communications Controller, is configured and controlled by the microprocessor. The SCC must convert all transmitted data from serial to parallel before buffering it to RAM; it then converts the data back to serial to send it either to the host or over phone lines. The SCC supports a synchronous port for communication with the fax chip set and an asynchronous port for communication with the PAL.

- The PAL, Programmable Array Logic, is made up of three IC's. Their functions are to:

    - Act as an I/O expander to provide more input/output lines

    - Provide timing control logic to generate the modified clock and read/write signals

    - Generate the decoded signals used to address the ROM, RAM and I/O

- The Ring detector signals the microprocessor to initiate the OFFHOOK signal. This signal closes the switches and allows the data to flow into the AppleFax Modem from the phone lines.

- The Data Pump is the R96 FAX chip set. Its main function is to receive and send all fax files using high speed (9600 bps) synchronous data transmission operating in half duplex mode. The chip set includes tone detectors and a tone generator used for control information when transmitting or receiving data with a Group 2 facsimile machine. It also provides equalization functions for optimizing communication over phone lines.

AppleFax Modems Operational Modes

The AppleFax Modem can communicate with another AppleFax Modem or facsimile machine using one of its three operational modes: fax mode, data mode, pass-through mode. The mode of communication is determined when a fax modem first establishes contact with another device over the phone lines, by a command from the host, or by setting the Mode Switch.

Fax Mode

Fax mode is used for transmitting and receiving fax formatted files in communication with another AppleFax Modem (also in fax mode) or facsimile machines. In fax mode, only bit-image data is exchanged. It is sent line by line following the appropriate data format for the fax environment. Rate of transmission to accomodate line conditions and matching of facsimile capabilities (group 2 or group 3 format) is established at connection. No error checking of data is done; transmission is one way.

Data Mode

In data mode, the AppleFax Modem in communication with another AppleFax Modem transmits and receives packets of data. In this mode characters are sent using built-in error detection. During communication the modems can adjust their rates of transmission to compensate for poor quality communication lines.

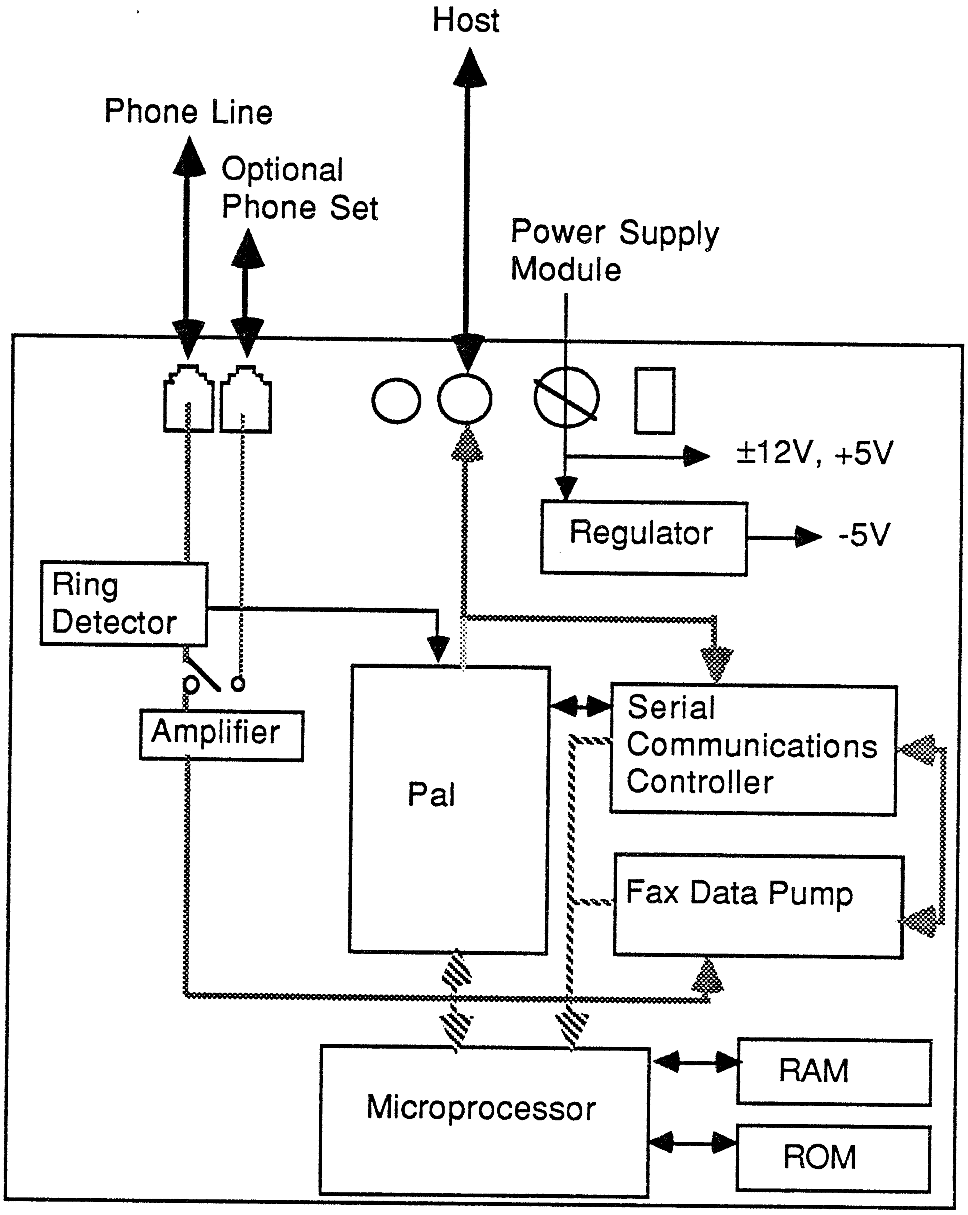


Figure 4: AppleFax Modem Fax Mode/Data Mode Functional Block Diagram

Mini-circular 8-pin functions from controlling device to AppleFax Modem in fax/data mode.

Pin#	Signal	Description
1	HSKO	Request to Send
2	HSKI	Undefined
3	TXD-	Transmit data to the host
4	SG	Signal Ground
5	RXD-	Receive data from host
6	TXD+	Transmit data to the host
7	GPI	Undefined
8	RXD+	Receive data from host

Pass-through Mode

The third transmission mode of the AppleFax Modem is the Pass-through mode. In this mode, the data is passed through the modem directly to a serial device attached to the pass-through modem port.

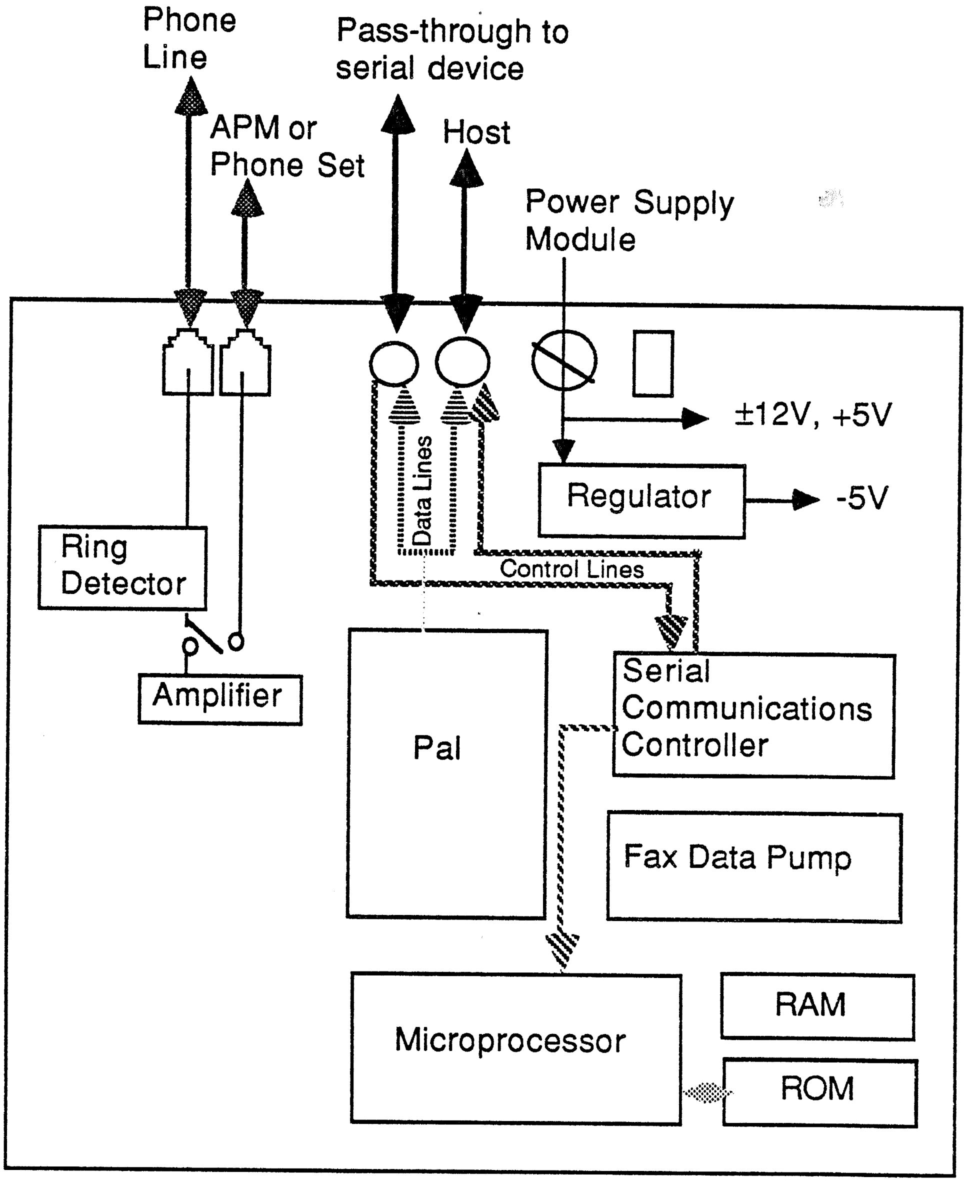
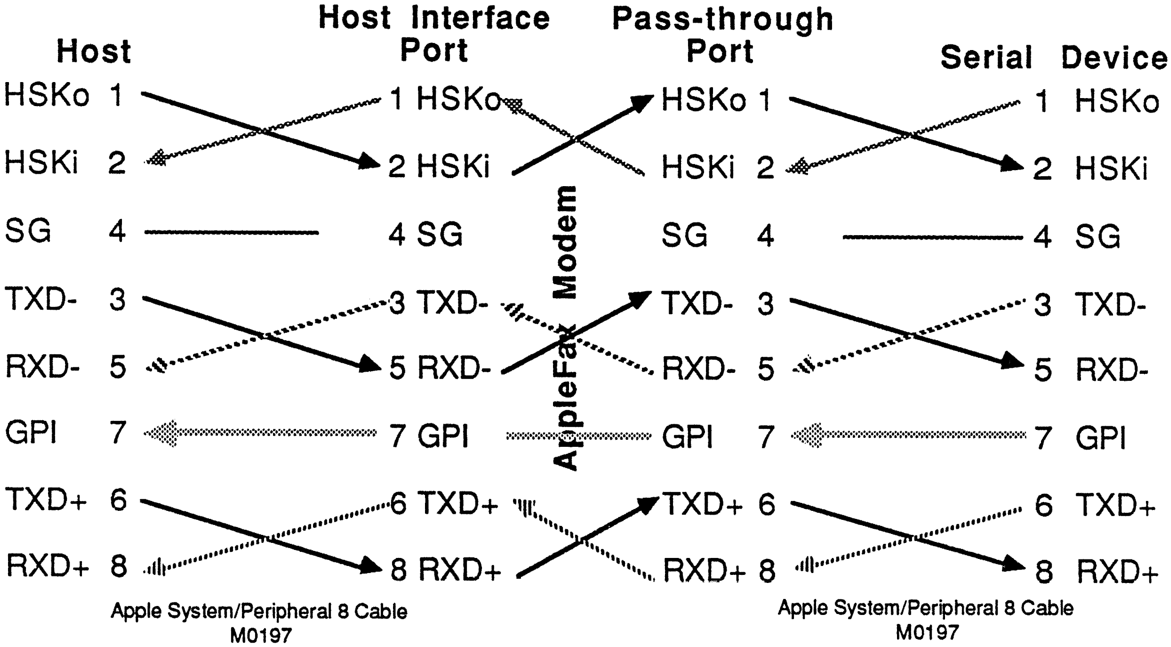


Figure 5: AppleFax Modem Pass-through mode Functional Block Diagram

Below is a diagram showing the path of signals through the AppleFax Modem when in pass-through mode. The data lines of the controlling device and the pass-through modem port are connected by hardware circuits permitting the data to pass through the AppleFax modem bypassing the internal logic. The three handshaking lines, HSKo, HSKi, and GPI are controlled by the firmware. For example, input from the pass-through port first enters the SCC and is then redirected to the controlling device with an overall delay of 65 msec.



The interface protocol is established by the host and the attached serial device. The modem only passes the data between the two; no interpretation of the data takes place in the fax modem.

Power Supply

The AppleFax Modem uses an external power supply which attaches to the modem by a cable with a 7-pin DIN connector. Full wave rectifiers and filters produce ±12V. A regulator produces the +5V and a -5V regulator internal to the AppleFax Modem generates the -5V power from the -12V source.

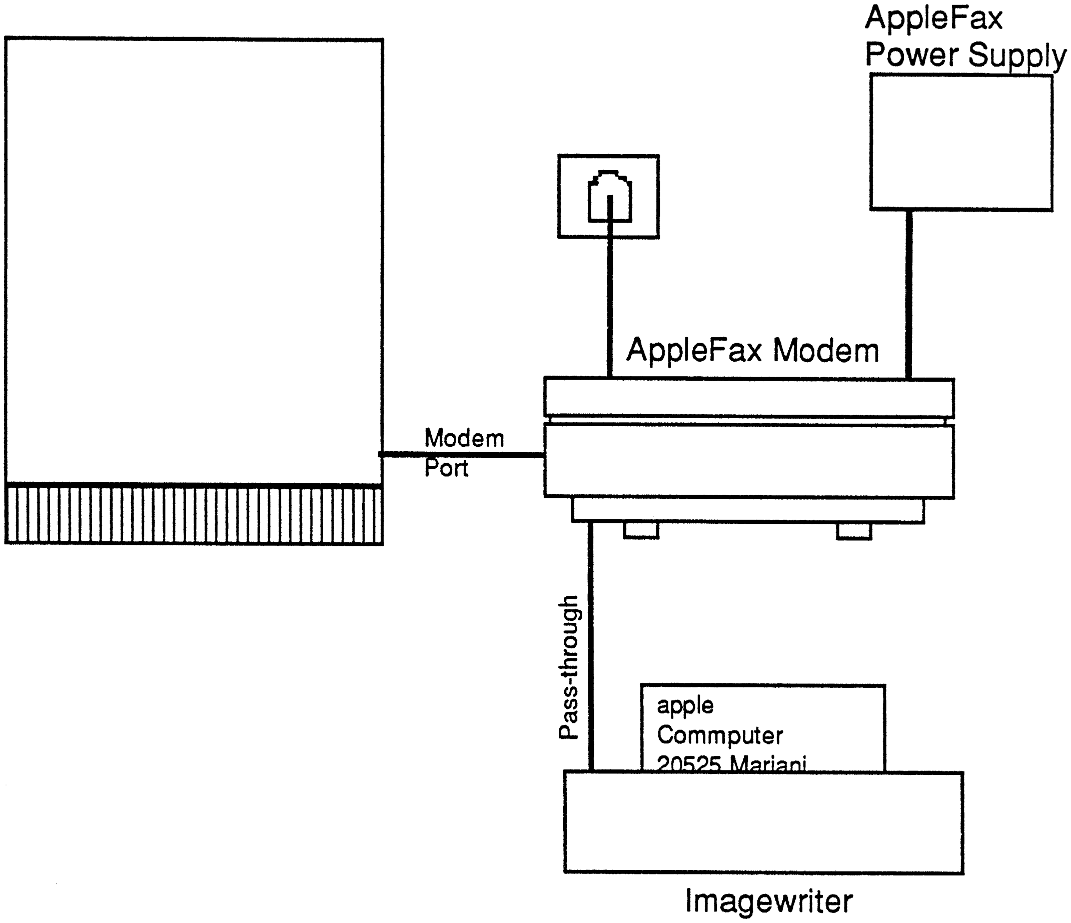
Even though the AppleFax Modem power supply looks the same as that for the Apple IIc and both use the 7-pin DIN connector, they are not interchangeable. No damage to either device will occur if they are inadvertently exchanged.

Configurations

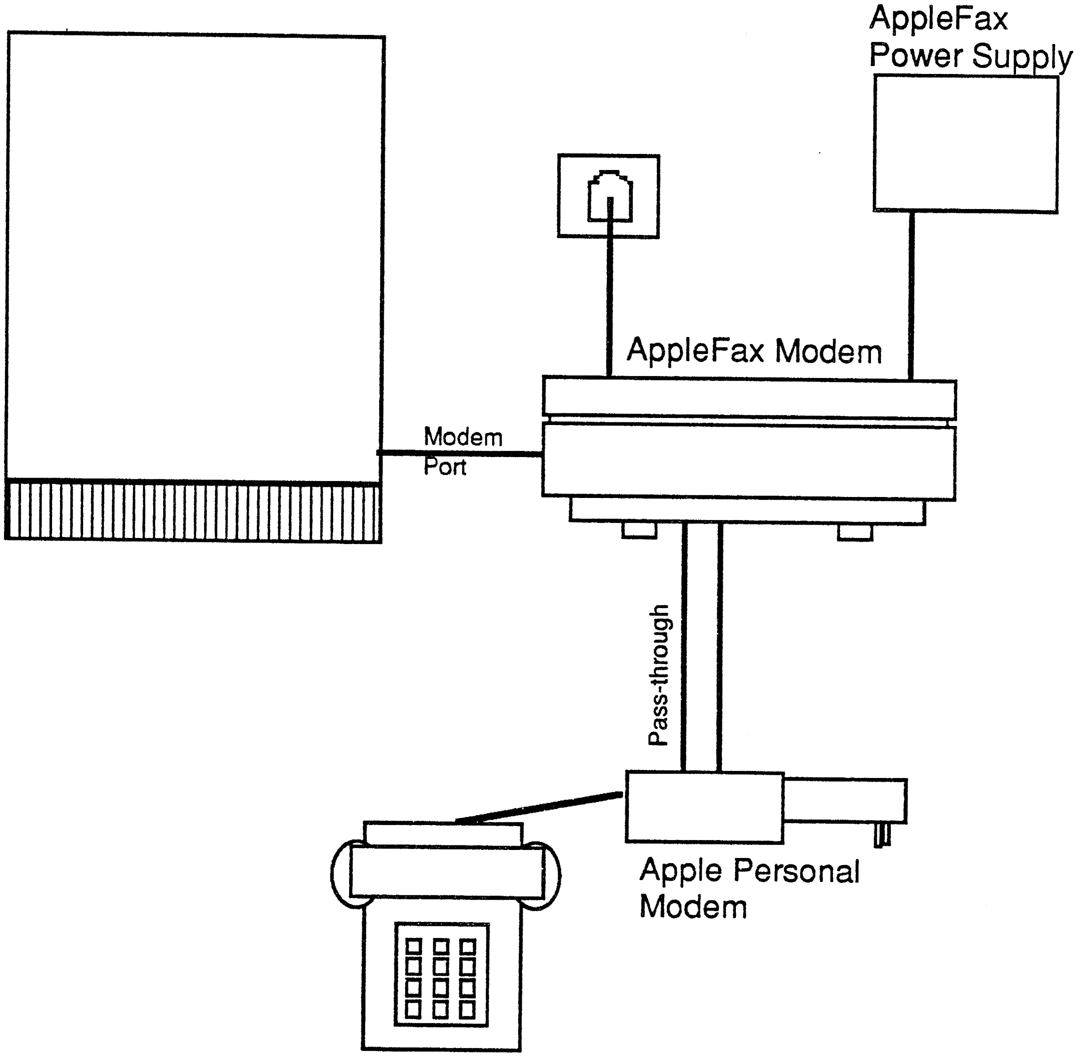
When configuring an AppleFax Modem into your system configuration, it's important to remember the connectors on the modem are not interchangable; each has been designed for a specific function. Check icons on the rear panel of the modem for correct cabling configurations.

When connecting a general purpose modem to the AppleFax Modem use a telephone cord between the two devices. The AppleFax Modem should be connected to the wall jack.

The modem requires the Apple System/Peripheral 8 Cable (M0197); this is not included with the modem.



Configuration 1: AppleFax Modem and serial printer

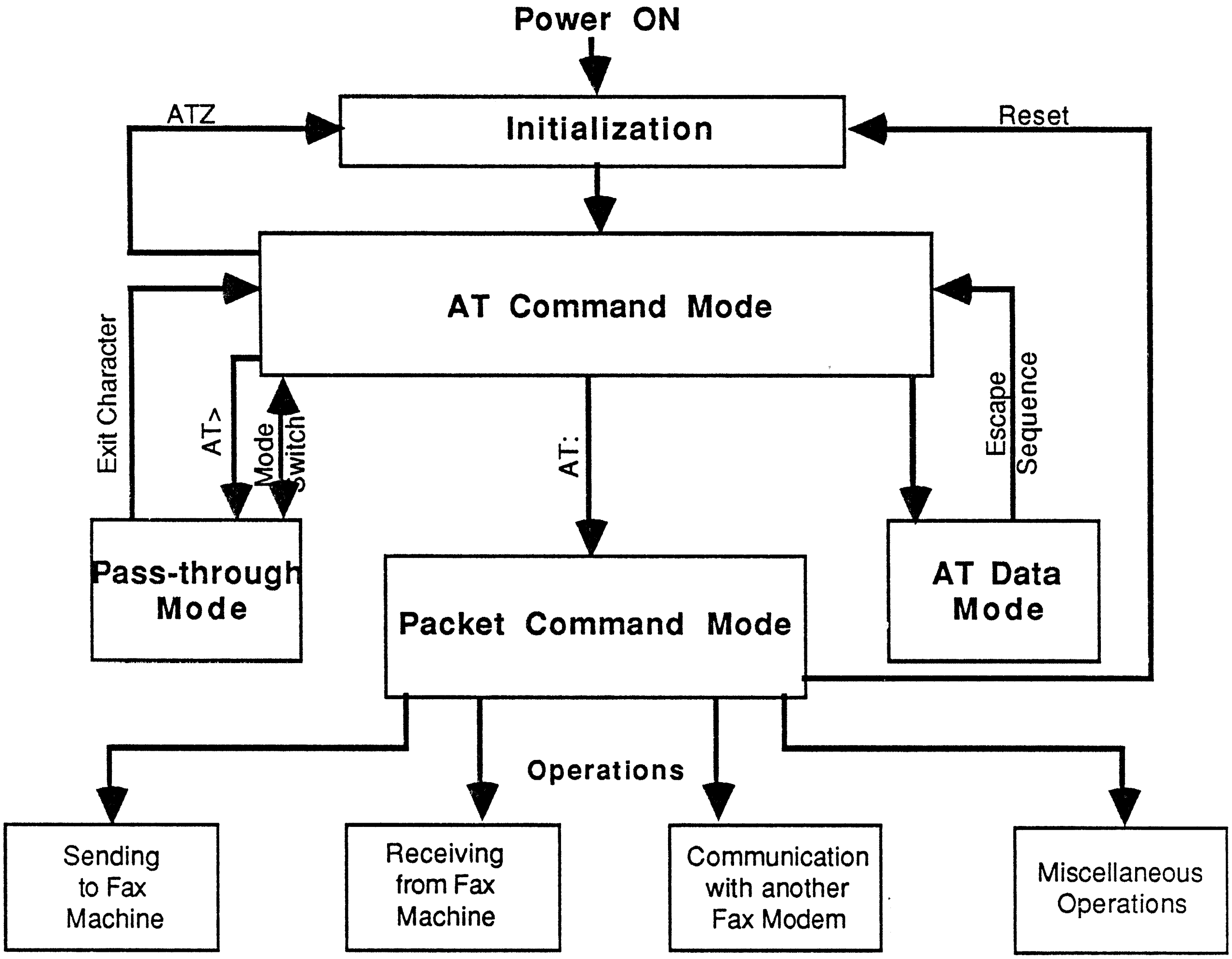


Configuration 2: AppleFax Modem, general purpose modem, and optional phone set

Firmware

OverView

The following diagram represents the operational modes of the AppleFax Modem firmware:



Power-up/Reset Procedures

On power-up, if the firmware does not detect the presence of the manufacturing test fixture, it will perform several tests of the modem's major components: ROM, RAM, SCC, and Data pump. If any of the self-tests fail, the indicator lights on the front of the modem will flash indicating the modem should be taken to the dealer for service.

After successful completion of the self-tests, the firmware initializes all of the modem's internal registers and hardware devices to the initial states for the AT command mode.

AT Command Mode

The AT command mode performs two functions that are necessary for any type of AppleFax operation: 1) it establishes the baud rate of the connection with the controlling device and 2) it allows entry to the other AppleFax modes (AT Data Mode, Pass-through Mode, Packet Command Mode).

When in the AT command mode the modem is controlled by simple text commands from a terminal or computer running a communication application like MacTerminal the same as the Apple Personal Modem.

The communication application must be configured for:

Handshaking: CTS or RTS
Local Echo: Echo Off
Duplex: Full Duplex
Bits: 8 data bits, 1 stop bit, 1 start bit
Baud Rate: 9600

AT Data Mode

The modem enters the data mode when a connection is established with a remote AppleFax modem. The modem will receive data characters from the controlling device, packetize the data, and send the packets to the remote modem. It will also receive packets from the remote modem, depacketize the data and send the data to the controlling device.

The packets contain error detection information, which allows for retransmission of erroneous packets. If too many errors are detected the modems automatically will lower their data rates.

Pass-through Mode

Pass-through mode is entered by: 1) pressing the mode switch causing the yellow LED to be on steady, or 2) by issuing an AT> command. If the switch is used to enter this mode, it must also be used to exit pass-through mode.

Packet Command Mode

The Packet command mode is used specifically for communication with a facsimile machine or another AppleFax modem operating in fax mode or data mode. This mode is entered when the "AT: " command is executed.

When in packet command mode, the AppleFax Modem is controlled by packet commands. Commands are either immediate or delayed. Immediate commands execute immediately and return a Return response on completion. Delayed commands take varying amounts of time to execute and do not return a response on completion.

The Status command indicates whether a command is currently executing or is completed. Use Status to determine the state of a delayed command and GetResult will return the Result response on completion of the delayed command. GetResult returns the result of the last command, immediate or delayed.

There are three types of packet command formats used for communication between the modem and the controlling device: Command Packet, Return Response Packet, and Result Response Packet. These packets include fields to specify which command or which command's response (return or result) is contained in the packet, the length of the Data, the Data, and two checksums for detecting errors in packet transmission.

In addition to packets, there are three signals that can be sent between the controlling device and modem: ACK, NACK, RESET.

The modem performs 6 tasks when in the packet command mode:

Command Reception Task -- the modem receives a command from the controlling device, verifies the checksums, sends an ACK or NACK signal, and if the checksums are okay the command is placed in the queue or executed immediately.

Command Execution Task -- the modem verifies arguments of the command, executes the command from the queue, places responses on the response queque.

Response Transmission Task -- the modem sends the response to the controlling device.

Connection Maintenance Task -- the modem establishes and maintains a connection with a remote device.

Flow Control Task -- the modem monitors the memory available for command reception, controlling transmission of commands from the controlling device.

Break Detection Task -- the modem monitors the line from the controlling device for a break condition.

Packet Mode Operating Sequences

Transmitting to a Facsimile Machine

The modem first establishes a connection by executing the FaxDial command from the controlling device. This command includes parameters with which the modem identifies itself and its facsimile capabilities to the remote device. After communciation has been established with the remote device, the controlling device issues the FaxTransmit command then the TransmitLine command is issued for each line of data.

The controlling device must prepare the data in the correct format for the type of fax machine receiving the data. Transmitting to a group 2 facsimile, data must be converted to lines of exactly 1728 pixels (216 bytes). They will be transmitted leftmost byte first, with the most significant bit of each byte being the leftmost bit in the line. For group 3 transmission, the data must be converted to lines of 1728, 2048, or 2432 pixels then converted to Huffman-encoded run length form (refer to CCITT T.4).

After the last line of data for a page has been sent, a TransmitEnd is issued. The sequence will repeat until all pages have been transmitted. At this time the controlling device issues a Disconnect command to close the connection and hang up the phone.

Receiving from a Facsimile Machine

Once the fax modem detects an incoming call (this is done by checking the value in register 1 with the GetRegister command), the FaxAnswer command from the controlling device is executed. This command includes parameters with which the modem identifies itself and its facsimile capabilities to the remote device. After communication has been established with the remote device the controlling device issues the FaxReceive command then the ReceiveBuffer command to initiate receiving the data and collecting of the data. The ReceiveBuffer command must be executed at the average rate of data comming from the remote device.

When the controlling device detects the flag in the ReceiverBuffer return packet (indicating all data for a page has been received) the ReceiveEnd command is issued and executed. The sequence repeats until all pages have been received. At this time the controlling device issues a Disconnect command to close the connection and hang up the phone.

Communicating with another AppleFax Modem

The controlling device should issue TransmitPacket and ReceivePacket commands when exchanging data with a remote AppleFax Modem in the Data Open State. This state is determined by the controlling device executing a GetResult command upon completion of the FaxDial command.

S Registers

The AppleFax Modem's internal registers control various modem operations. In AT mode, these registers are accessed via the S command, while in the Packet command mode use GetRegister and SetRegister commands.

Registers 0 through 18; many of these are familiar such as Auto-Answer and Line Feed Character, typical of those found in the Apple Personal Modem. Three of these registers are specific for the Packet command mode: Group 3 Line Time, Transmit Line Counter, and TransmitLine ACK Option. These are documented in Appendix B of the AppleFax User's Guide.

Registers 19 through 31 are reserved for future expansion and should not be accessed.

Registers 32 through 63 access the registers in the Rockwell data pump chip set. The AppleFax modem initializes these registers to their initial values at Power ON; any of the register values can be set from 0 to 255 (consult the Rockwell specifications to determine the appropriate values for each register).

Firmware Library for AppleFax Software Developement

A library of AppleFax Modem functions provides convenient low-level access to the fax firmware commands. The library was created with MPW and may be linked to any MPW application. An application normally would use the Print Manager to access the AppleFax Modem. But if it needs special functions not accessible through the provided resource, use of the library will insure future compatibility. The library will be available through Software Licensing.

Software

There are two methods for sending fax files -- with the AppleFax Resource or the AppleFax Application. The AppleFax Resource functions primarily as a printing driver and can be used only to send or save individual fax files. The AppleFax Application is rich with options permitting the sender to transmit multiple files and receive multiple files; files can be either fax format or any Macintosh file.

FAX

Applefax Modem

AppleFax Resource

Functionality

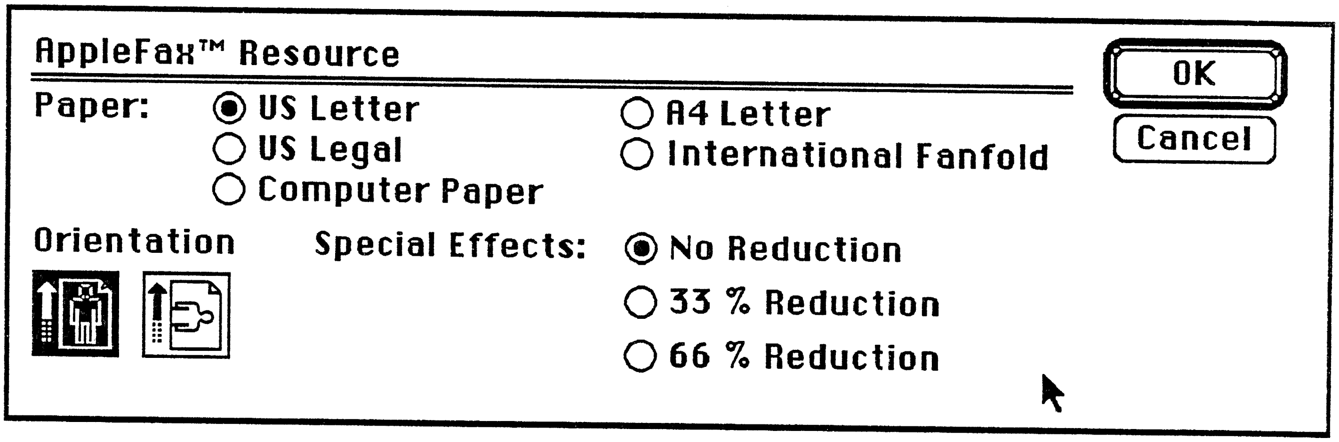
With the AppleFax Resource you can send a single fax file immediately (from the desktop or within an application), or save a fax file to disk. A fax file is created from the current (selected) Macintosh document. If the fax file is sent immediately, it will be deleted on completion of transmission. Whether the file is sent or saved the original document remains intact.

The resource always spools fax files to a temporary file on disk. This is done to avoid memory constraints that would place limits on the image size. However, this does mean that the size of fax document is limited by the space available on the current disk. While spooling a file, the resource tells the calling application that it is in draft mode. This prevents the application from opening and closing the resource for every page, which would in turn cause the modem to hang up and redial.

To select the AppleFax Resource, open the Chooser and select it as you would any other printing resource. The resource replaces the current application's page and print dialog boxes with its own. Selecting the Page Setup and Print commands from an application's File menu will display the following dialogs:

Dialogs

- The Page Setup Dialog allows the user to specify imaging options: paper specification, orientation, and reduction specifications, about the output to a remote fax machine.


AppleFax™ Resource

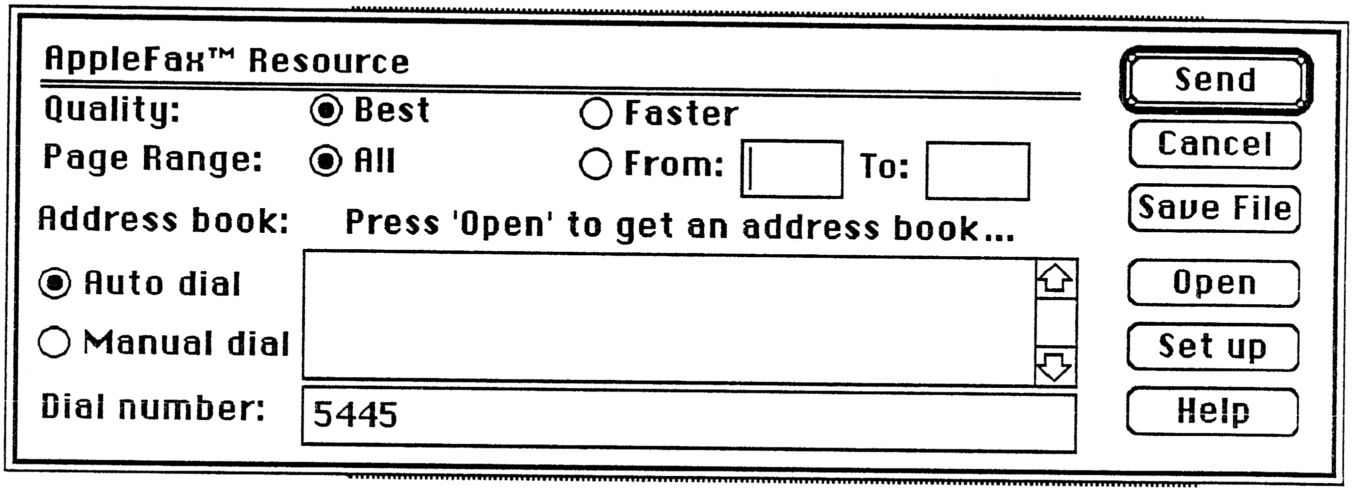
Paper: ● US Letter ○ A4 Letter
○ US Legal ○ International Fanfold
○ Computer Paper

Orientation

Special Effects: ● No Reduction
○ 33 % Reduction
○ 66 % Reduction

Figure 6: AppleFax Resource Page Setup Dialog

- The Print Box allows the user to specify: quality, page range, auto/manual dial, the number to dial and whether to send the file immediately or to save the fax file to disk.


AppleFax™ Resource

Quality: ● Best ○ Faster

Page Range: ● All ○ From: To:

Address book: Press 'Open' to get an address book...

● Auto dial

○ Manual dial

Dial number: 5445

Figure 7: AppleFax Resource Print Box

Quality: When Best is selected, the fax file will be transmitted with a vertical resolution of 200 lpi. Faster transmits at 100 lpi (every other line). (Note: this will only cause a degradation of output quality when a file is being reduced.)

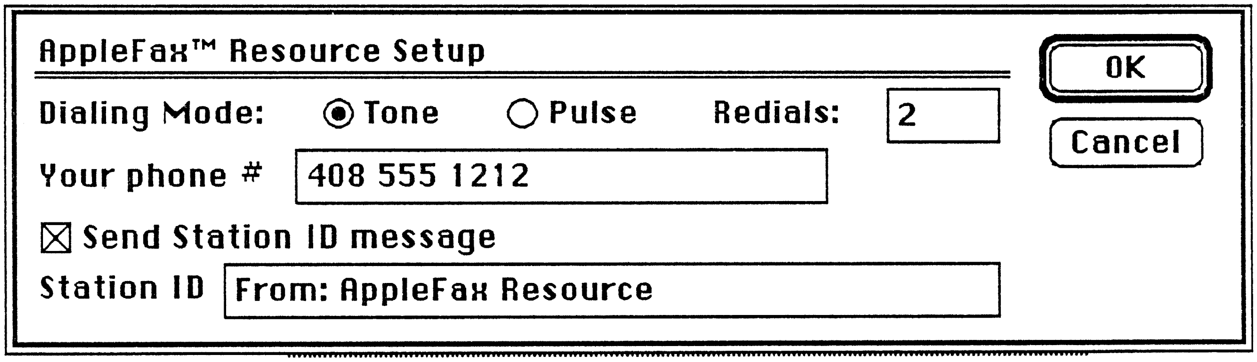
Selecting Save File displays a standard Save dialog box allowing you to select a device, folder, etc. to save to, and whether to save the entire document or only text.

Open allows access to any saved address book (The address book is a file created within the AppleFax Application). From the resource, the address book is a read-only source; selecting an address places the phone number of the address into the Dial number field of the Print Box where it can be edited.

When Auto dial is selected the AppleFax Modem dials the number entered in the Dial number field. Manual dial permits the sender to dial using an optional phone set attached to the modem. A dialog box will be displayed when the user should dial the number.

Dial Number text: The maximum length of this field is 64 characters; only 0-9 , () - t Tp P # * can be entered.

- The ResourceSetup Box is displayed when Set up is selected from the Print Box. With it you identify your "station" by name and phone number. This information will print on the top of each page along with the date, time and page number if the Send Station ID message is checked. It is also possible to select Dialing Mode and enter the number of redials your modem should attempt when encountering a busy number.



AppleFax™ Resource Setup

Dialing Mode: ● Tone ○ Pulse Redials: 2

Your phone # 408 555 1212

☒ Send Station ID message

Station ID From: AppleFax Resource

Figure 8: AppleFax Resource Setup Box

Application

Functionality

The AppleFax Application provides flexibility for sending single or multiple files to a single address or to multiple addresses. The files can be fax files created with the AppleFax Resource or any Macintosh file.

The application lets you receive files from another AppleFax Modem or facsimile machine. The application must be open to receive incoming files; it will not function in the background under Multifinder.

There are three options available for printing fax files selectable from the Fax Menu and an option to view fax formated files, but fax files cannot be edited. Other options available through the application include polling of a receiving address and a forwarding function.

The AppleFax Document Window

As with all Macintosh applications, a document is created when the application is opened. The AppleFax Document window is unique because it does not store Macintosh files. Rather, it stores information about files to be sent and instructions on how and where to send them. The window is divided into four main areas: New Envelope Stack, Wastebasket, Envelope View, and Address List.

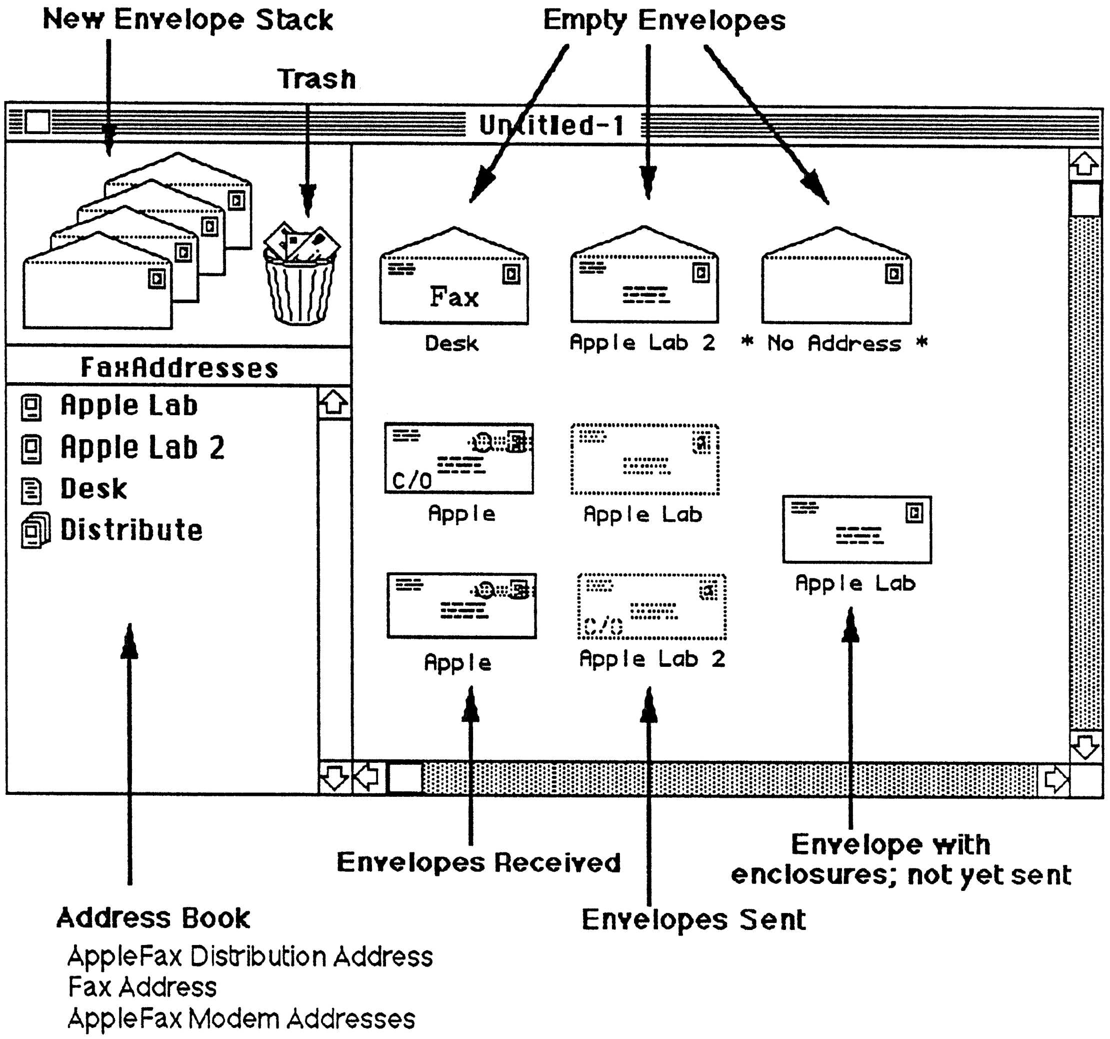


Figure 9: AppleFax Window/Envelope Types

The Envelope Please

There are many different envelope icons. This gives a quick visual representation of the status of envelopes in the current AppleFax document (See Fig. 9). You can create a new envelope by dragging the New Envelope Stack icon to the envelope view area. To address the envelope drag an address from the address list over the envelope. Double-clicking on an envelope displays the Envelope Contents window so that you can add files to the envelope.

Envelope Contents Window

From within the Envelope Contents window you can add to or remove from an envelope or just view its contents.

When Copy Files is selected in the Envelope Contents window (See Fig. 10) the AppleFax application will create duplicate files of those files added to the envelope. The duplicate files are stored in the AppleFax application folder. This insures the files will be available when transmitting the envelope. This is useful when the original file is located on a diskette that has been ejected.

The AppleFax application renames the files with the address of the envelope attaching a number in sequence to each additional file added to the envelope.

All duplicate files are deleted when the envelope is thrown away.

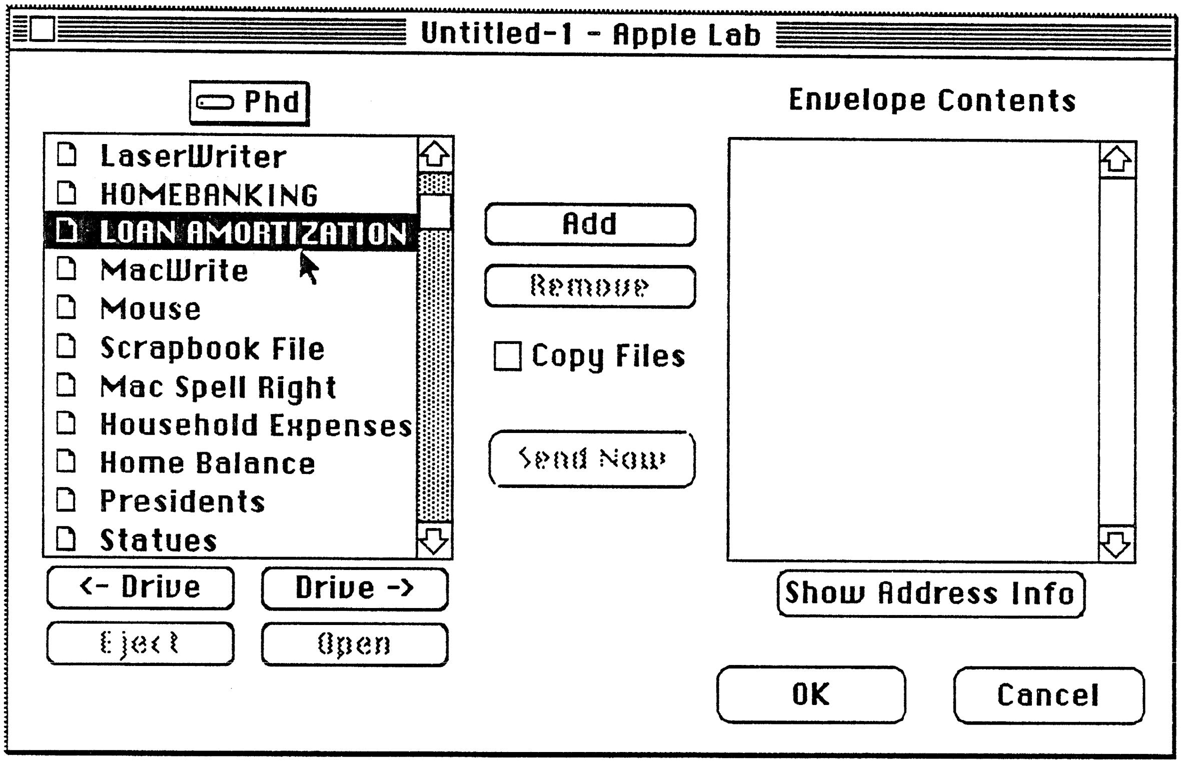


Figure 10: Envelope Contents Window

Changing an address option from the contents window, when Show Address Info is selected, changes the option for that envelope only; the Address Book does not change.

Envelopes can be sent immediately or the application will send them at the time specified in the Address Book.

Once an envelope has been sent, you cannot open or change any of its contents or options, unless Restore Envelope is selected from the Fax Menu.

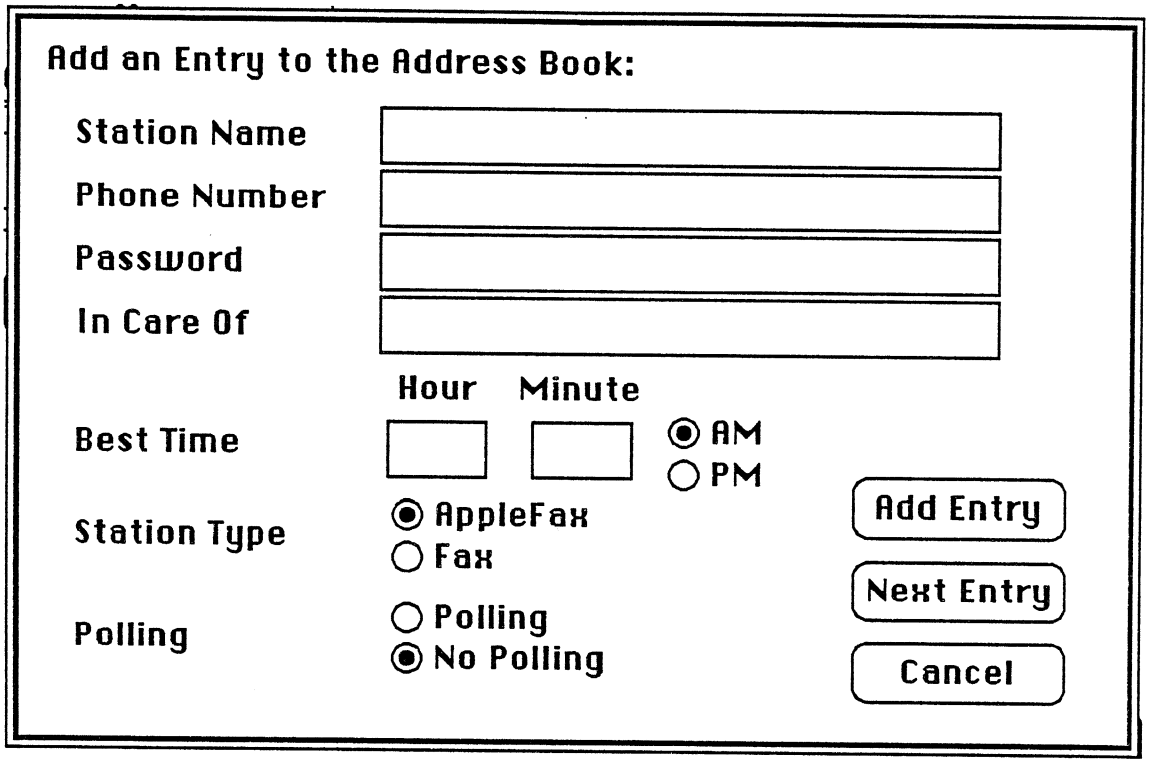
Address Book

The Address Book maintains information that instructs your "fax station" where and how to send envelopes. On opening the AppleFax application, a dialog is displayed for you to select which address book you wish to use or click on the button New. An address must be entered into the address book before you can send envelopes to that destination.

From the Address Book Menu you can make additions to the current address book, create distribution lists, or display the address book window. From the application window you can delete, change, or select addresses or distribution lists contained in an address book. An address book can be used with only one document at a time.

Address Entry

To add a new address, select New Address from the Address Book menu. To change options of an existing address, double click on the address in the address list of the document window. A dialog box will display the following options:



Add an Entry to the Address Book:

Station Name

Phone Number

Password

In Care Of

Best Time Hour Minute ● AM ○ PM

Station Type ● AppleFax ○ Fax

Polling ○ Polling ● No Polling

Figure 11: Address Entry Dialog

- **In Care Of:** By using an In Care Of address you can temporarily store envelopes at another address. This address would then forward the envelope to its final destination. Here is a very useful technique for faxing long distance: send all envelopes to an address from which all forwarding transmissions would be local calls.

The In Care Of address must be in the current Address Book. You must also know the password of the designated In Care Of address. An address designated as an In Care Of address cannot have an In Care Of address. If this were possible envelopes might never reach their intended destination.

NOTE: Fax machines cannot be In Care Of addresses.

- **Best Time:** Select a time at which you want the AppleFax application to send envelopes to this address. This should be a time when the address is available to receive transmissions; consider the cost by sending after prime phone times (after 5pm or before 8am), or when your own system will not be be in use.

- **Polling:** Polling allows you to search the receiving AppleFax window for envelopes addressed to your "station". Polling is only available between AppleFax modems.

- **Password:** When polling an address you will be requested to enter the password of the receiving "station". When leaving envelopes with an In Care Of address the receiving "station" will request its password. These provide privacy of the polled station's own files and cost protection to an In Care Of address.

  Passwords can only be used with AppleFax addresses. They are not case-sensitive and can only be 20 characters long (letters only -- no numbers or punctuation).

Distribution Lists

A distribution list is a collection of AppleFax addresses or Fax addresses used to send a single envelope to multiple addresses. A distribution list does not support polling; all options of the list override the options of the individual addresses within the list (for example, Best Time).

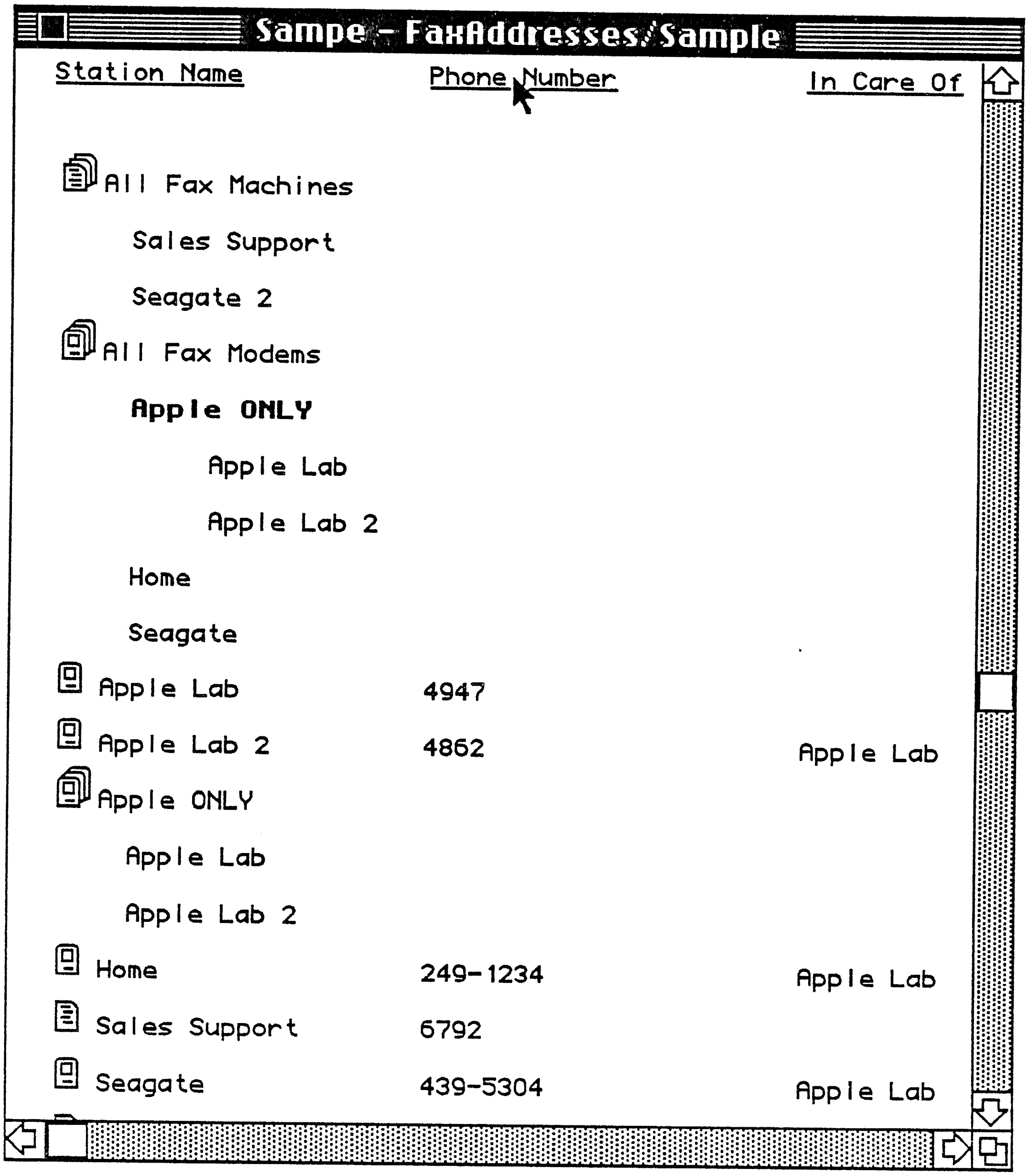
To create a list from the current address book, select Create Distribution List ... from the Address Book menu. The dialog box also displays options for Best Time, In Care Of and name. To change options for an existing distribution list, double click on the name in the address list of the document window.

Address Book File Format/Address Record

Following is the address book file format:

<Number of Address Records in the file>
<Individual address record>
:
<Last individual address record>
<Distribution list reference>**
:
<Last distribution list reference>
<EOF>

** The distribution list reference is an address name of an address included in a distribution list. When fNumAddrs (see below) is greater than 0, the number in this field represents the number of distribution list references to be read in.



Station Name	Phone Number	In Care Of
All Fax Machines		
Sales Support		
Seagate 2		
All Fax Modems		
Apple ONLY		
Apple Lab		
Apple Lab 2		
Home		
Seagate		
Apple Lab	4947	
Apple Lab 2	4862	Apple Lab
Apple ONLY		
Apple Lab		
Apple Lab 2		
Home	249-1234	Apple Lab
Sales Support	6792	
Seagate	439-5304	Apple Lab

Figure 12: Address Book

The address record data structure:

```
AddrSaveRec = Record
        fStationName:        String[20];
        fPhoneNumber:        String[64];
        fPassword:           String[20];
        fMachType:           Boolean;    (* Fax or Modem*)
        fViaAddress:         String[20]; (*In-Care-Of*)
        fHour:               Longint;     (*Best Hour*)
        fMinute:             Longint;     (*Best Minute*)
        fPolling:            Integer;
        fInList:             Integer;      (*0 = not in a
        distribution list, else the number of lists in which
        the address is included*)
        fNumAddrs:           Integer;     (*0 if a single
        address, else this is a distribution list and number
        denotes the number of addresses in the list*)
```

Activity Report

Select Activity Report from the Fax Menu to display the activity report. The activity report keeps track of the envelopes that you have sent or received during use of the current AppleFax application document. The report displays the contents of the envelopes you have received or sent. It also indicates whether transmission of an envelope was successful or records errors that may have occurred during transmission.

The activity report is saved with the document; an envelope's status information will remain in the report until the envelope is thrown away. When the activity report window is displayed its contents can be printed by selecting Print from the File Menu.

Compatibility

With a Facsimile Machine

Because of differences in the way a fax machine conforms to the standards for group 2 or group 3 communications, difficulties can arise when communicating with some fax machines. If you are able to transmit to other fax machines with your AppleFax Modem, it is probable the fax machine is not compatible with the standards followed by the AppleFax modem.

Applications and the AppleFax Resource

Not all applications have followed the Macintosh programming quidelines for printing, making them incompatible with the AppleFax Resource. If a system error occurs, you will need to restart your Macintosh. Then use a different application to send your document or convert the document to a fax file.

Print Quality

Files sent to an AppleFax Modem

When sending a fax file to an AppleFax station, the type of printer and the fonts in the receiving host's system file determine the quality of the printed fax file. Suggestion: when using a special font, send the suitcase of the font in the envelope with the document.

Files sent to a Facsimile Machine

To get the highest-quality printed output, use the Best option in the Page Setup dialog box. You must select this prior to sending or saving a fax file.

It's best to use the LQ fonts when creating documents that will be transmitted to a fax machine: a font three-times the size of the display font should be installed in your System file (this is because fax machine output has a resolution of 200 dpi). QuickDraw will request the font manager to select a three-times font; this image will be compressed to one-third its size and printed on a fax at a density three times that of the screen.

To insure a clearer image of a fax file being sent in reduced mode, select the Best option in the Page Setup dialog. Transmission in vertical orientation will result in a better quality output.

Further Reference

CCITT recommendation T.30: *Procedures for Document Facsimile Transmission in the General Switched Telephone Network*

CCITT recommendation T.3: *Standardization of Group2 Facsimile Apparatus for Document Transmission*

CCITT recommendation T.4: *Standardization of Group3Facsimile Apparatus for Document Transmission*

CCITT recommendation V.27: *4800/2400 bps Modem Standardized foe Use in the General Switched Telephone Network*

CCITT recommendation V.29: *9600 bps Modem Standardized for Use on Point-to-Point 4-Wire Leased Telephone Type Circuits*

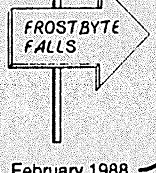
Rockwell International data sheet 29200N24: R96FAX Modem Functional Characteristics

Other Apple references, *Inside Macintosh* Volume 2, AppleFax User's Guide, and AppleFax Modem Preliminary Notes (9/29/87).

Specifications

Dimensions	7.88"D x 4.75"W x 2.00"H
Weight (excluding Power Source)	1.5 lbs.
Microprocessor	65C112 (1.8432 MHz)
ROM	32K x 8
RAM	8K x8
Fax Modem	
Type	R96 fax-compatible chip set
Modulation	Quadrature Amplitude Modulation (QAM) Frequency Shift Key (FSK) Amplitude Modulation (AM) Single SideBand (SSB)
Receive Level	-10db to -40db
Signaling and Data Rates	
2400 Baud	9600, 7200, 4800 bps
1600 Baud	4800 bps
1200 Baud	2400 bps
Carrier Frequencies	
T.3	2100 Hz
V.27 ter	1800 Hz
V.29	1700 Hz
Operating Temperature	+10° to +40°C
Storage Temperature	-40° to +47°C
Transit Temperature	-40° to +65°C
Humidity Range (Non-condensing)	20% to 95% RH
Power Requirements	
AC Input (US and Canada)	120V±10%, 60 Hz
AC Input (Japan)	100V±10%, 50/60 Hz
Power Consumption	10 Watts maximum
DC Current Rating	
+5V dc	1.0 Amp (external)
-5V dc	50 mAmp (on-board)
+12V dc	200 mAmp (external)
-12V dc	200 mAmp (external)

OVERHEADS

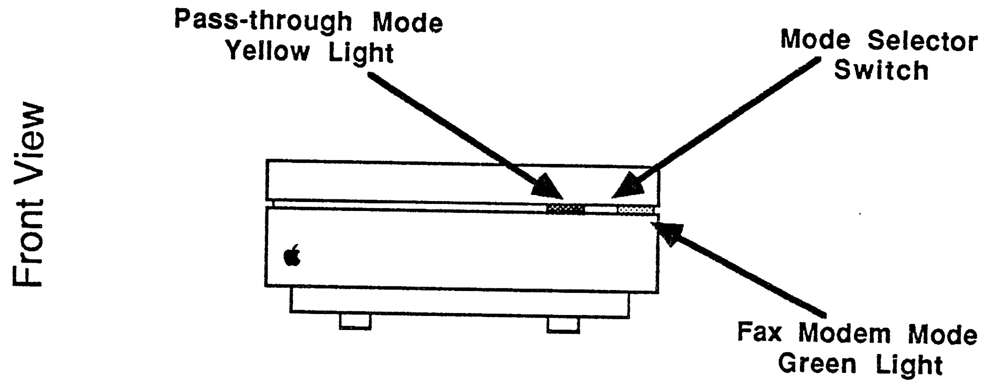


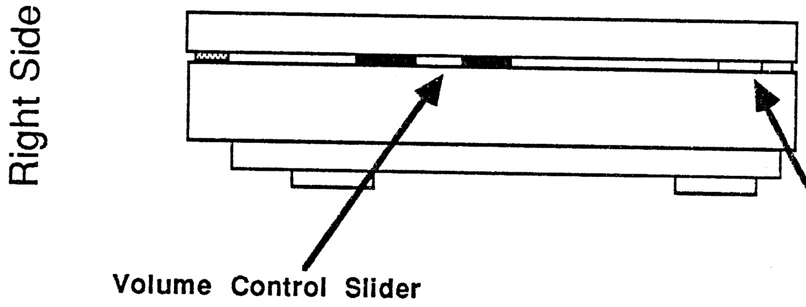
Facsimile Technology

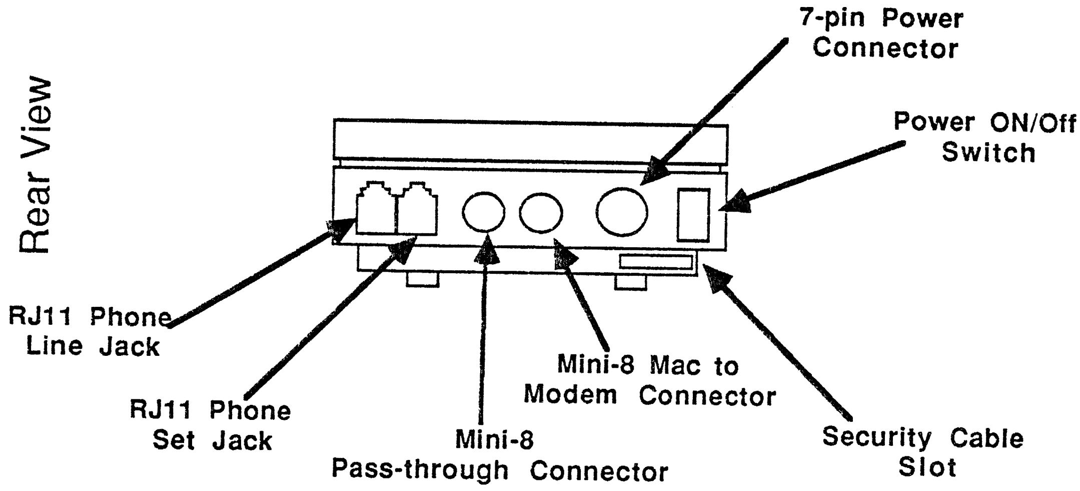
What is it?

How Does it Work?

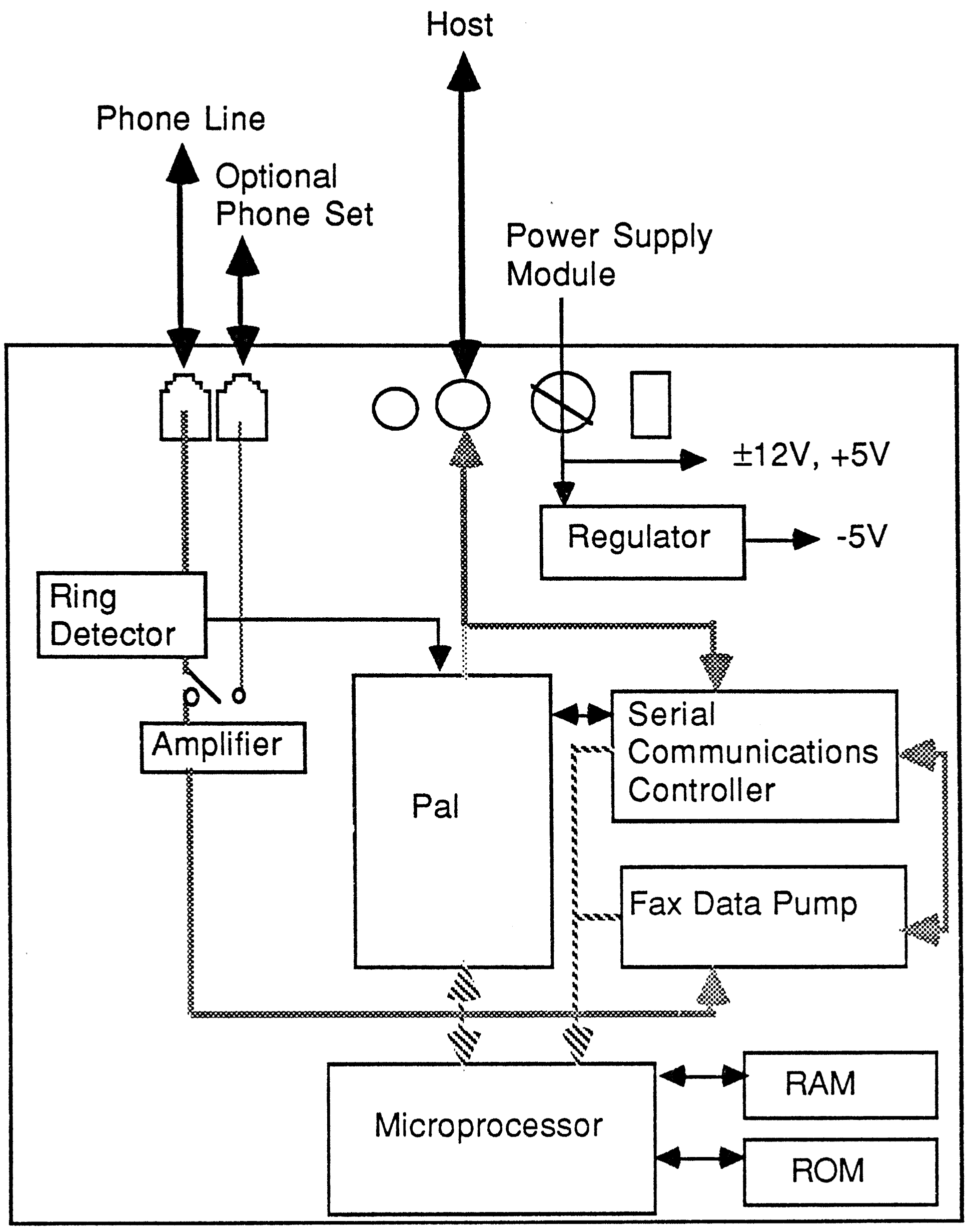
External Views of the AppleFax Modem



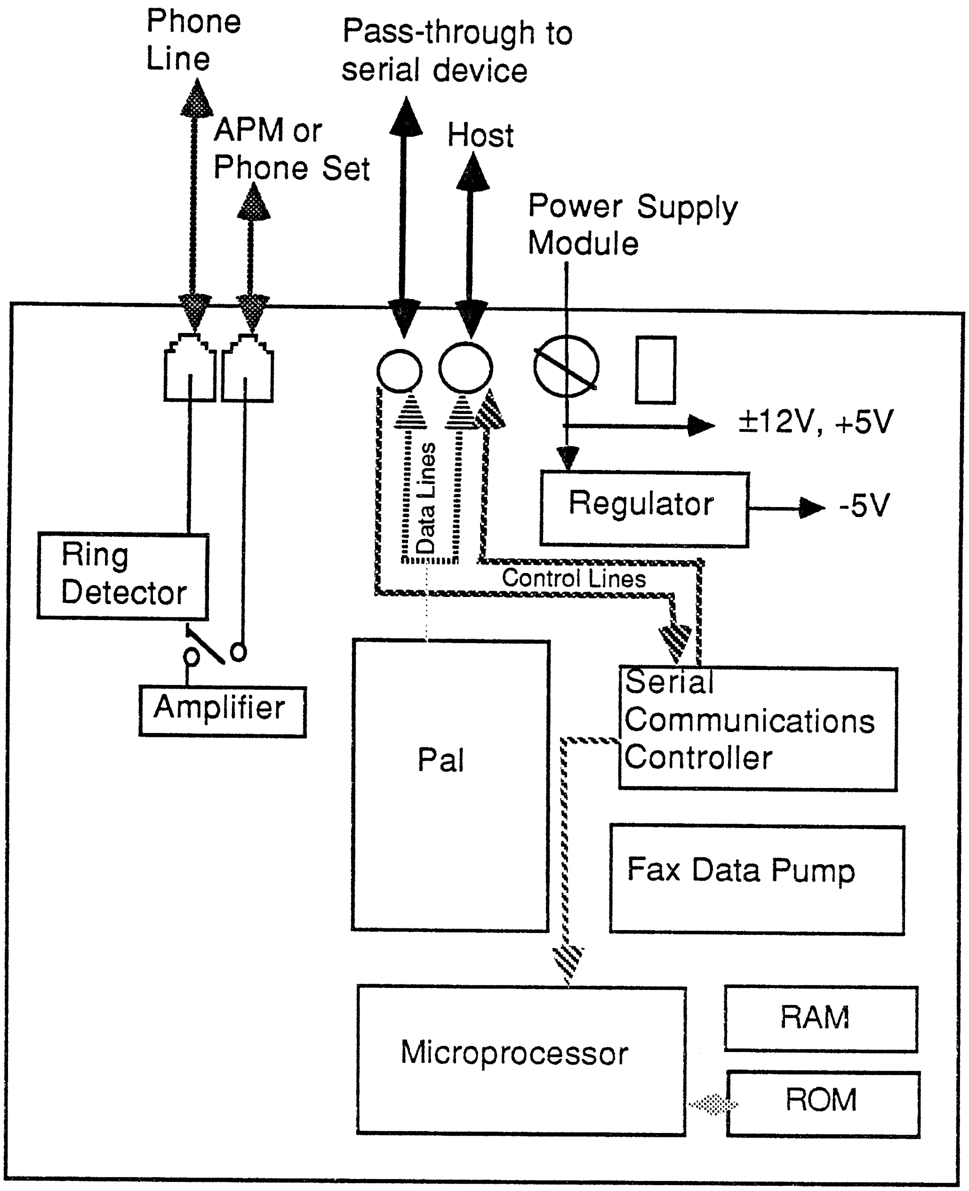




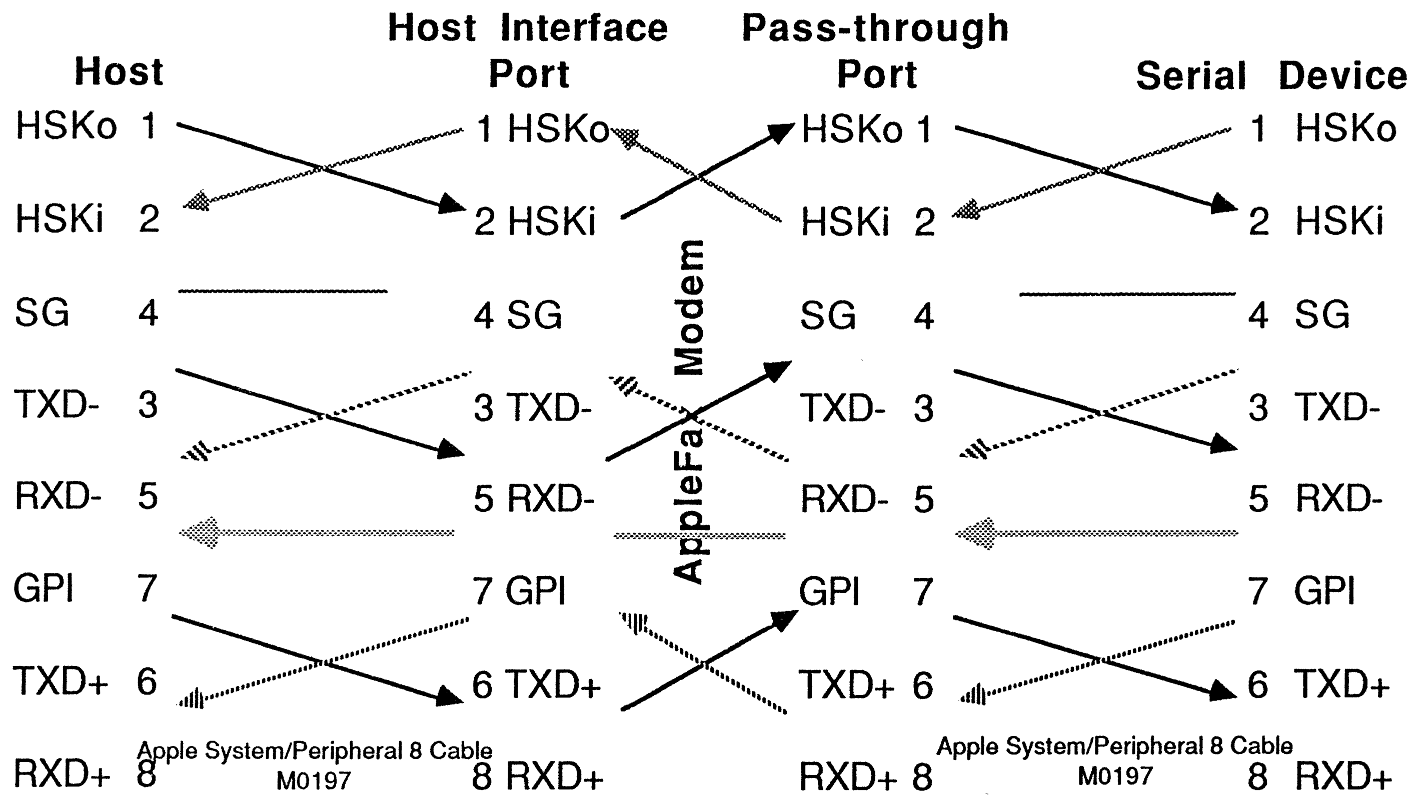
Fax Mode/Data Mode Functional Block Diagram



Pass-through Mode Functional Block Diagram



Interface Signals in Pass-through Mode



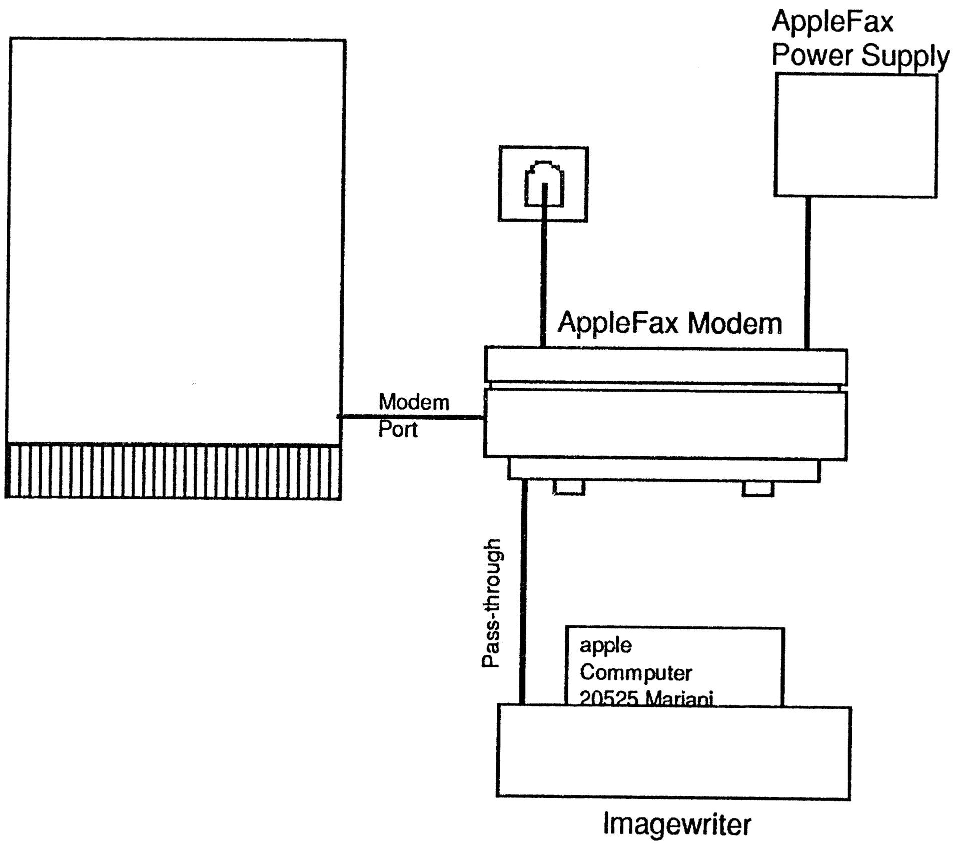
Host	Host Interface Port	Pass-through Port	Serial Device
HSKo 1	1 HSKo	HSKo 1	1 HSKo
HSKi 2	2 HSKi	HSKi 2	2 HSKi
SG 4	4 SG	SG 4	4 SG
TXD- 3	3 TXD-	TXD- 3	3 TXD-
RXD- 5	5 RXD-	RXD- 5	5 RXD-
GPI 7	7 GPI	GPI 7	7 GPI
TXD+ 6	6 TXD+	TXD+ 6	6 TXD+
RXD+ 8	8 RXD+	RXD+ 8	8 RXD+

AppleFax Modem

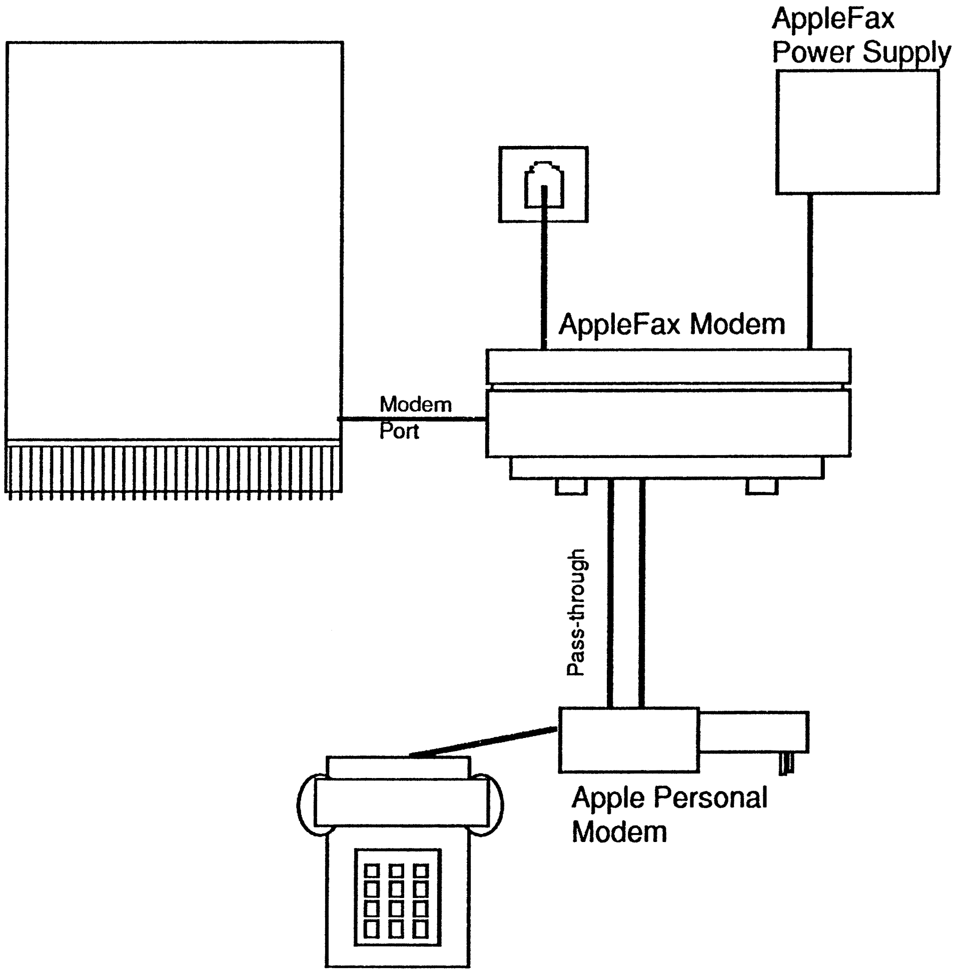
Apple System/Peripheral 8 Cable
M0197

Apple System/Peripheral 8 Cable
M0197

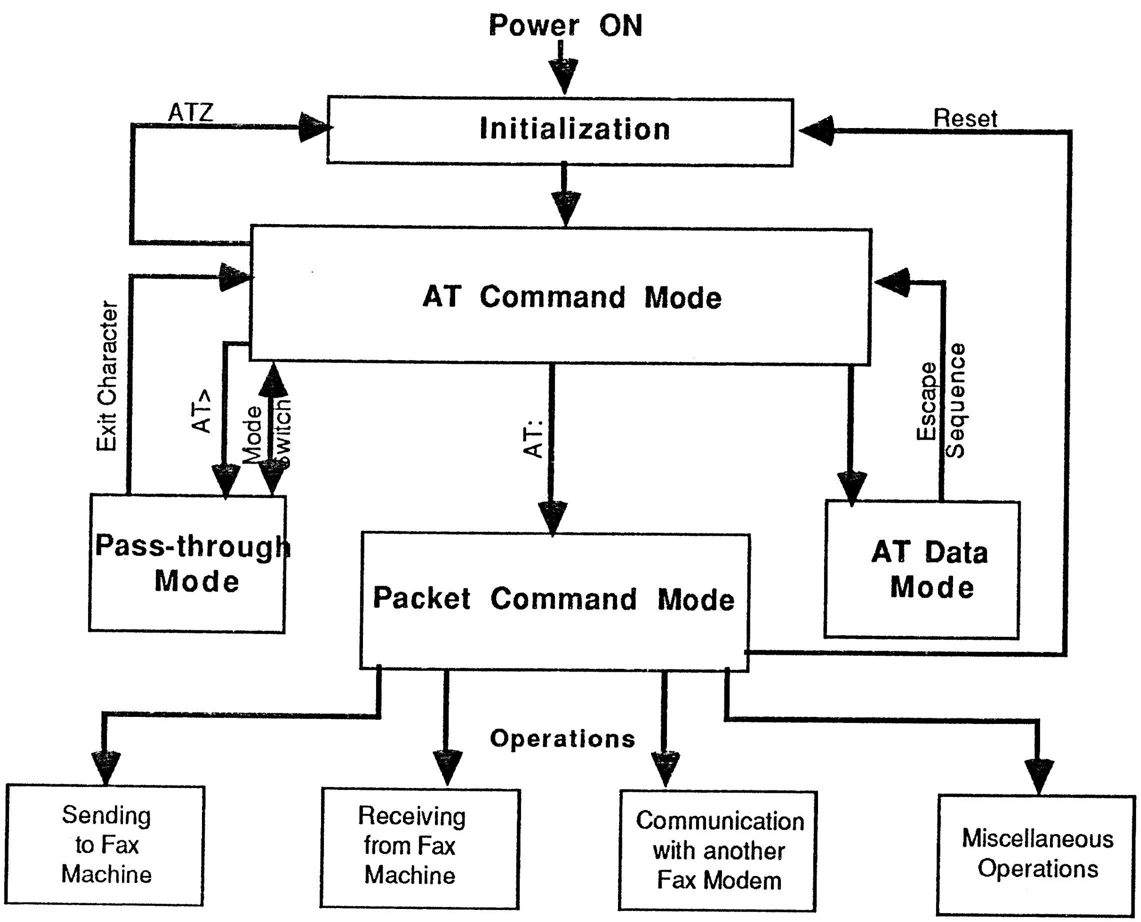
AppleFax Modem Configured with a serial printer



AppleFax Modem Configured with an APM and Phone Set



AppleFax Modem Firmware Overview



Packet Command Mode

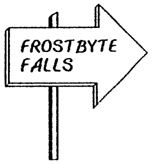
Type	Length	CheckSum1	Data	CheckSum2

Packet Format

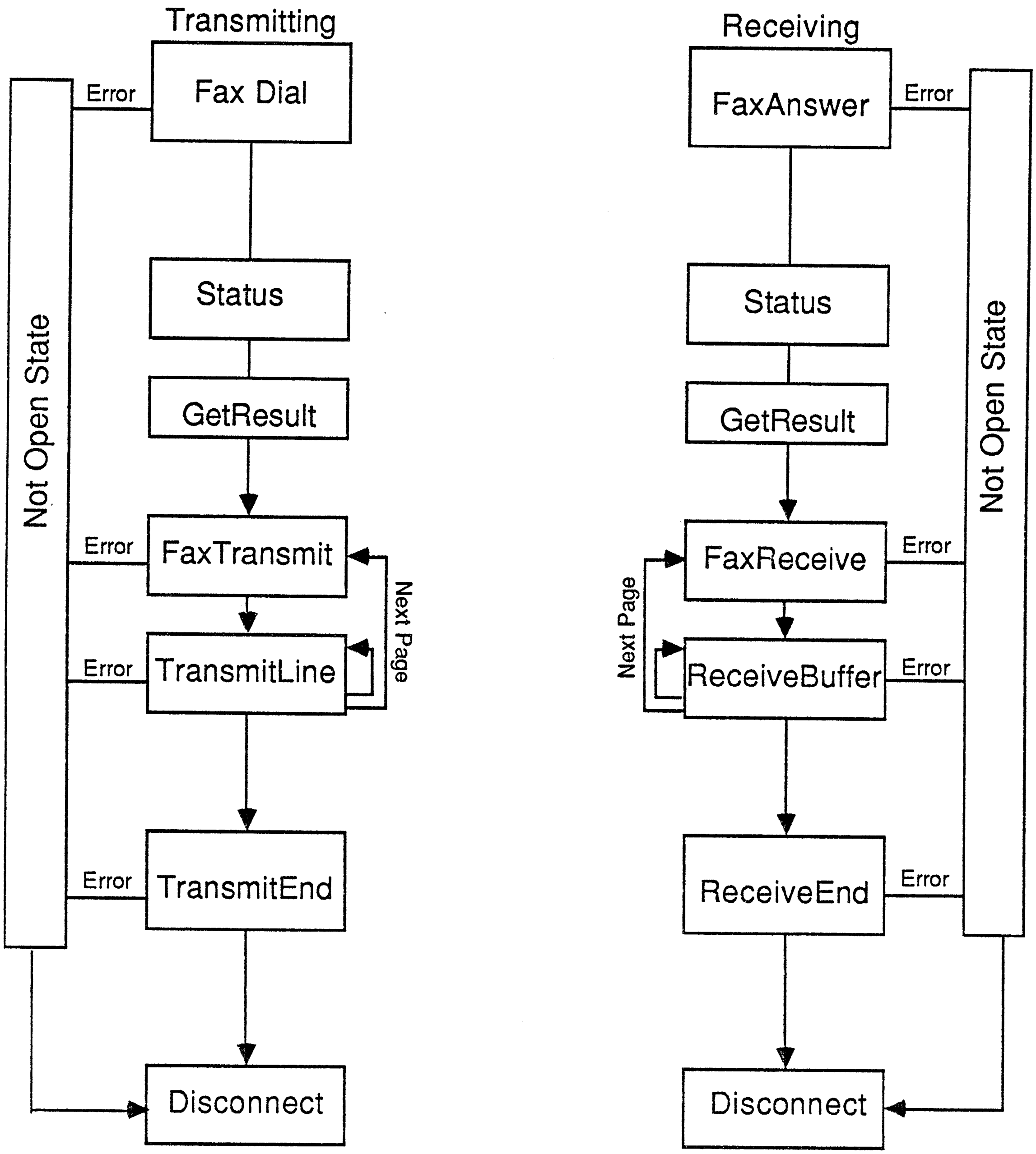
3 Packet Types: Command, Response, Result
2 Types of Commands: Immediate, Delayed

Six Modem Tasks

- Command Reception Task
- Command Execution Task
- Response Transmission Task
- Connection Maintenance Task
- Flow Control Task
- Break Detection Task



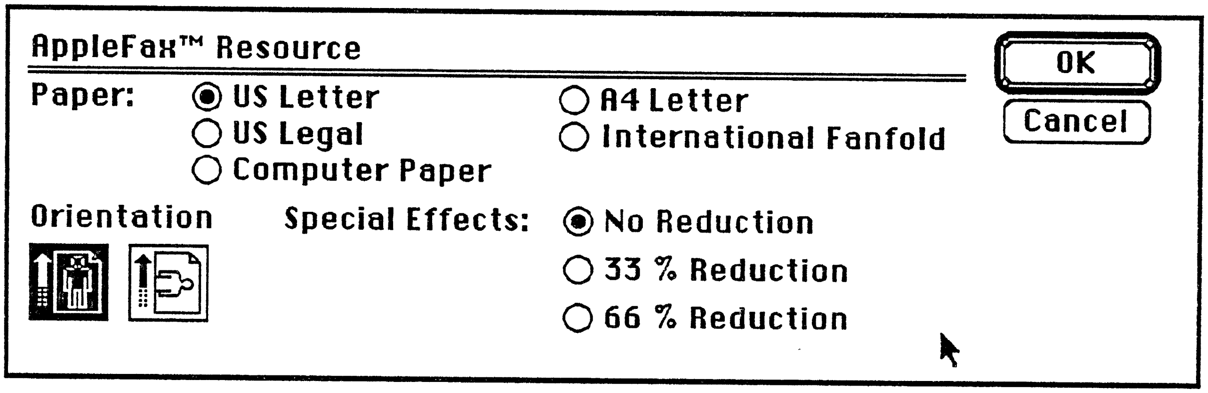
Packet Mode Operating Sequences



AppleFax Software

- AppleFax Resource
  - Send single fax files immediately
  - Spool files to a temporary file
  - Select AppleFax Resource with the Chooser
  - Select Print from any application to create a fax file
- AppleFax Application
  - Send multiple files to multiple stations
  - Receive files from other AppleFax Modems or Facsimiles
  - Permit viewing and printing of fax formatted files
  - Support options for polling and forwarding

AppleFax Resource Dialogs

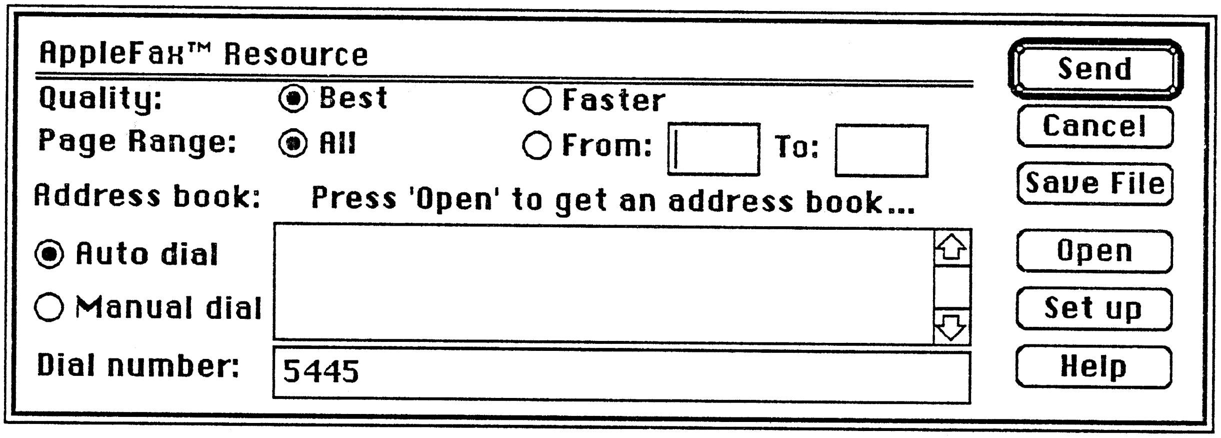

AppleFax™ Resource

Paper: ● US Letter ○ A4 Letter
○ US Legal ○ International Fanfold
○ Computer Paper

Orientation

Special Effects: ● No Reduction
○ 33 % Reduction
○ 66 % Reduction

Page Setup


AppleFax™ Resource

Quality: ● Best ○ Faster

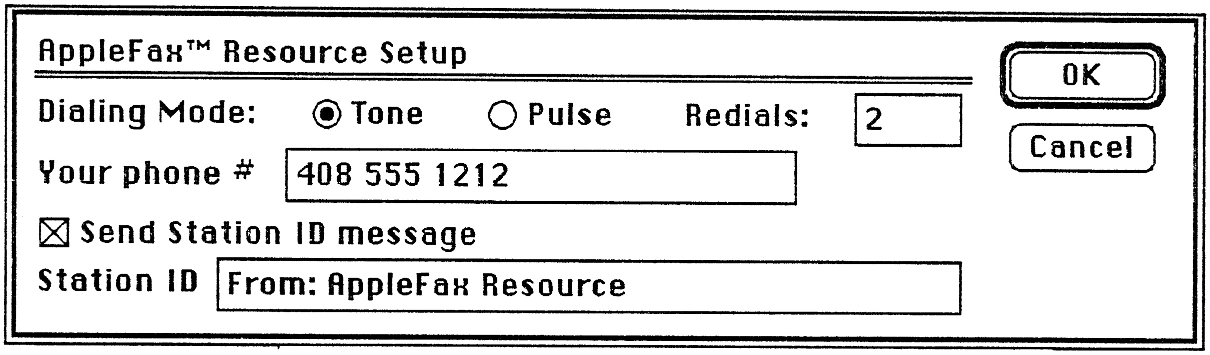
Page Range: ● All ○ From: To:

Address book: Press 'Open' to get an address book...

● Auto dial
○ Manual dial

Dial number: 5445

Print . . .


AppleFax™ Resource Setup

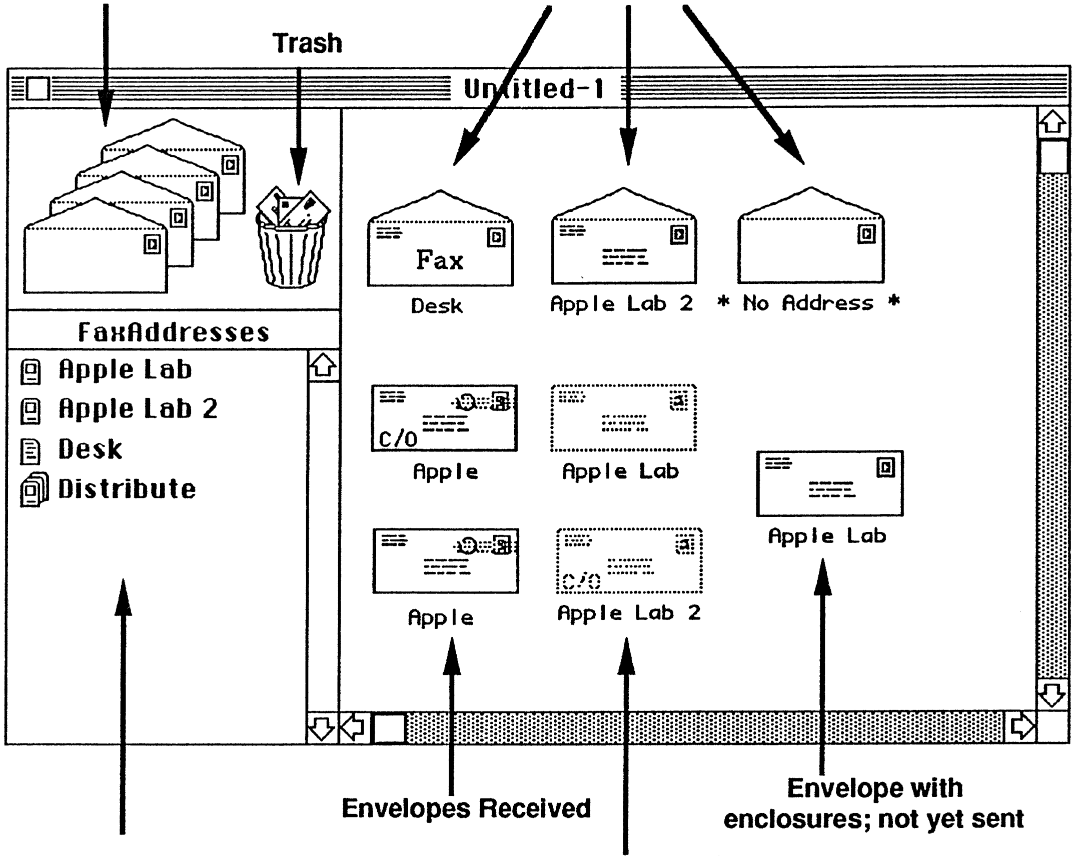
Dialing Mode: ● Tone ○ Pulse Redials: 2

Your phone # 408 555 1212

☒ Send Station ID message

Station ID From: AppleFax Resource

AppleFax Application Document Window



New Envelope Stack

Trash

Empty Envelopes

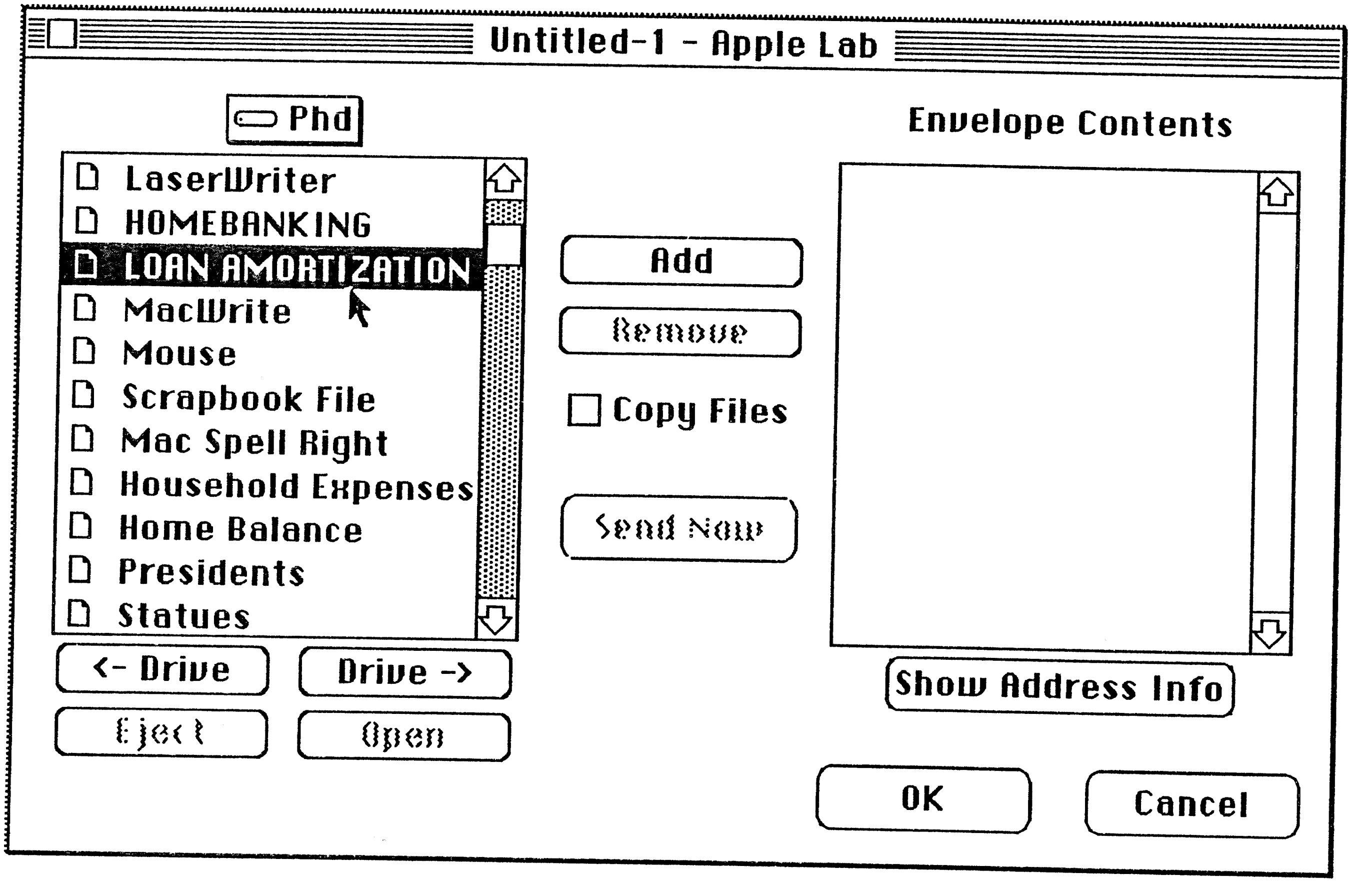
Envelopes Received

Envelope with enclosures; not yet sent

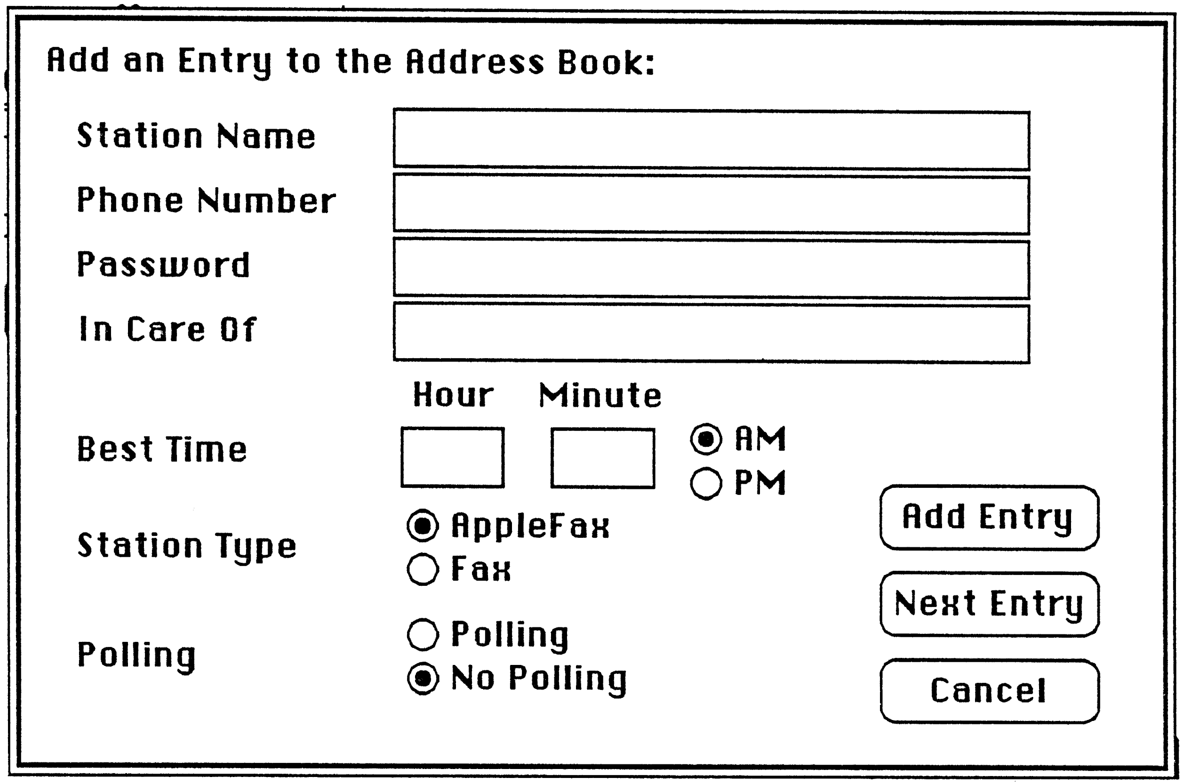
Envelopes Sent

Address Book:
AppleFax Distribution Address
Fax Address
AppleFax Modem Addresses

Envelope Contents Window



Address Entry



Add an Entry to the Address Book:

Station Name

Phone Number

Password

In Care Of

Best Time: Hour, Minute; ● AM ○ PM

Station Type: ● AppleFax ○ Fax

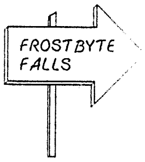
Polling: ○ Polling ● No Polling

Compatibility Issues

- With a Group 2 or Group 3 Facsimile
- Some Applications with the AppleFax Resource

Print Quality

- Files Sent to another AppleFax Modem
- FIles Sent to a Facsimile Machine
    - Use LQ Fonts
    - Files Sent Reduced use Best Option
    - Vertical Orientation



AppleFax Error Messages
2/9/88

Error Alerts:

1. "The Station Name is too long. It should be 20 characters or less."

   <obsolete>

2. "This Station Name is already in use. Please select another."

   If the user specifies a name that is already in use for another address, this message is displayed.

3. "This is an invalid Phone Number."

   If the phone number has no numbers this message is displayed.

4. "The Station Name for the In-Care-Of Address is too long. It should be 20 characters or less."

   <obsolete>

5. "This In-Care-Of Address is not in the Address Book. Please enter it before referring to it."

   If the user specifies an a name for an In Care Of address that does not already exist in the Address Book, this message is displayed.

6. "The type of address must match the type of envelope."

   <obsolete>

7. "This address can only be used for MAC envelopes."

   <obsolete>

8. "This address is not in the Address Book."

   <obsolete>

9. "This address is in use for an Envelope and can not be thrown away."

<obsolete>

10 ."This address is in use as an In-Care-Of Address and can not be thrown away."

If an address is used as an In Care Of address, it cannot be thrown away.

11. "An address with this Station Name is already in the Address Book"

When trying to add an address to the address book, if there is an address with the same name, this message will be displayed.

12. "A Station Name must be specified for an address."

The user must specify a station name for an address.

13. "A Phone Number must be specified for an address."

The user must specify a phone number for an address.

14. Mystery Error!!!

15. "Please address the envelope before enclosing documents."

If the user attempts to open an envelope that has not been addressed, this message is displayed.

16. "Please see Activity Report for information about this envelope."

If the user attempts to open an envelope that has been sent, this message is displayed.

17. "Please see Activity Report for information about this envelope."

If the user attempts to open an envelope that has been received, this message is displayed.

18. "Please select an address in the Address List first."

<obsolete>

19. "Please select an envelope first."

<obsolete>

20. "Please select Addresses of the same type - AppleFax or Fax."

When selecting addresses for a distribution list, the user must select addresses of the same type.

21. "The Hour must be in the range 1 to 12."

The hour for the Best Time must be a number in the range 1 to 12.

22. "The Minute must be in the range 0 to 59."

The hour for the Best Time must be a number in the range 1 to 12.

23. "The list is empty. Please select some Addresses for the list."

When closing a distribution list window and saving changes, if they have not selected an addresses for the list this message will be displayed.

24. "This Address is used in a Distribution List and cannot be thrown away."

If an address is used in a distribution list, it cannot be thrown away.

25. "The Distribution List cannot be selected to include in itself."

The user cannot select the distribution list to be included in itself.

26. "A Distribution List cannot be used for an In-Care-Of Address."

If the user specifies a name for an In Care Of address that denotes a distribution list, this message is displayed.

27. "No AppleFax Preference File. Using Default Settings."

If no AppleFax Preference File is found when the appllication is started, this message is displayed.

28. "Cannot create AppleFax Preference File. Settings are not saved."

For what ever reason (usually disk problems) the preferences file could not be created.

29. "An In Care Of address can not be a Fax machine."

When the user specifies an In Care Of address it cannot refer to a fax address.

30. "Please specify a Minute for the Best Time."

If the user does not specify a minute for the best time, this message is displayed.

31. "Please specify an Hour for the Best Time."

If the user does not specify a hour for the best time, this message is displayed.

32. "The Fax Modem cannot be used. Application will not run."

The fax modem library cannot be opened (problems with the fax modem hardware) when the application is started.

33. "Please check the Fax Modem - Power and/or Connections."

While trying to reset the modem and an error occurs this message will be displayed.

34. "Please reset the Fax Modem by turning it off and then on."

When the modem cannot be reset (after three tries) this message is displayed.

35. "An address in the Dist. list can not be used as an In-Care-Of."

An address in a distribution list cannot also be used as the In Care Of Address for that list.

36. "A Distribution List cannot be added to itself."

A distribution list cannot be selected to include in itself. This includes nesting the list in another list and trying to include that list in the first list.

37. "An Address cannot be used as an In-Care-of for itself."

An address cannot be specified to an In Care Of address for itself.

38. "Please turn the modem OFF and then ON."

When the modem cannot be reset (after three tries) this message is displayed.

39. "This Address Book is already in use. Please select another."

When the user selects an address book, they cannot select one that is already in use for an open envelope document.

40 . "In Care Of addresses are not allowed for Fax Addresses."

<obsolete>

41. "The Phone Number is too long - should be less than 64 characters."

<obsolete>

42. "There is not enough memory to open another document."

When selecting New/Open in the File menu and there is not enough memory to open a document this message is displayed.

43. "There is not enough memory to add more addresses."

When selecting New Address in the Address Book menu or Next Entry in the Add Address Dialog and there is not enough memory to add a new address this message is displayed.

44. "There is not enough memory to add a distribution list."

When selecting Create Distribution List in the Address Book menu and there is not enough memory to add a new address this message is displayed.

45. "There is not enough memory to display this folder."

When trying to open a file folder in the Envelope Contents window and there is not enough memory to store the directory for the folder this message is displayed.

46. "There is not enough memory to add the file(s)."

When trying to add files in the Envelope Contents window and there is not enough memory to store the file data structures this message is displayed.

47. "There is not enough memory to add a new envelope."

When trying to make a new envelope in the Envelope Document window and there is not enough memory to store the envelope data structures this message is displayed.

48. "There is not enough memory to open the envelope(s)."

When trying to open an envelope and there is not enough memory to store the data for the open envelope contents window this message is displayed.

49. "There is not enough memory to open the distribution list."

When trying to open a distribution list address from the address list and there is not enough memory to store the resultant data structures this message is displayed.

50. "Cannot copy the files to a locked volume."

When adding files with Copy Files selected to an envelope when the application is running on a locked disk this message is displayed.

51. "There is not enough memory to display the Fax Setup dialog."

When selecting Fax Setup from the Fax menu and there is not enough memory to open the dialog this message is displayed.

52. "There is not enough memory to address this envelope."

When trying to address an envelope and there is not enough memory to store the new address data structures for the envelope this message is displayed.

53. "There is not enough room to read in the Address Book."

There is not enough memory to store the entire Address Book file data.

54. "Wait for Poll cannot be used for an address with an In Care of."

If an address has an In Care Of address and the user selects Wait Until Polled, this message is displayed.

55. "An In Care Of address cannot itself have an In Care Of address."

An address used as an In Care Of address cannot itself be given an In Care of address.

56. "Please close any open envelope windows before throwing envelopes away."

When throwing away envelopes, if they have any open Contents windows this message is displayed.

57. "There was a disk error while reading the Address Book file."

While reading in the Address Book file, a disk error occured.

58. "The Address Book is too large to display in the Address Book Window"

The address book data is too large to display in the address book window. As much of the data that can be displayed is displayed.

59. "There was an I/O error while reading the Address Book file."

An I/O error occured while reading in the Address Book.

60. "This address is used as an In Care Of, it cannot be made a fax station."

If an address is in use as an In Care Of, the user cannot set its type to be Fax.

61. "Disks cannot be ejected from the keyboard while running AppleFax."

The application disables the f-keys used to eject disks.

62. "The disk is full, copying not performed."

While doing a Copy Files, this error is reported if the disk is full.

63. "An error occurred while copying the file, copying not performed."

While doing a Copy Files, this error is reported if an I/O error occurs.

64. "Please close Dist. List. windows before throwing away an address."

You cannot throw away an address if there are any open dist. list. windows (create and modify.)

65. "Memory is LOW! Please save your work and quit AppleFax!"

If free memory goes below 8K this alert is posted.

66. "Memory is REAL LOW! Please save your work and quit AppleFax, NOW!

If free memory goes below 5K this alert is posted.

67. "There is not enough memory to address the envelope."

There is not enough memory to address the envelope.

68. "The Activity Report is too big to display. Please discard some envelopes."

There are too many envelopes to display in the space allocated for the activity report.

69. "The disk is locked, cannot save the address book file."

Self-explanatory.

70. "The file is locked, cannot save the address book file."

Self-explanatory.

71. "The disk is full, cannot save the address book file."

Self-explanatory.

72. "The ICO address for the dist. list is used by an address in the list."

You cannot use as an ICO address for a dist. list an ICO address used by an address in a dist. list.

72. "There is not enough memory to set up this envelope."

When closing the contents window, if a memory error occurs this message is shown. The envelope will remain in its previous state.

NOTE ON COMMUNICATION ERRORS:

A communication error implies that something has happened in the application, library, firmware, modem hardware, or phone lines that has garbled/broken communications. The result is that something information header will not be sent or received breaking the synchronization between two applefax stations or to a fax machine. The specifics of the error are described below, but for the user, the primary intent is to simply tell them that something screwed up during the call and it wasn't completed correctly. The numbers in the error message denote where in the actual calling sequence the failure occurred.

Activity Report Errors for Envelopes:

1. "Connection Failed."

   Transmitter - Could not complete the connection to an AppleFax station.

2. "Communication Error (2)."

   Receiver - Could not read the envelope header information.

3. "Communication Error (3)."

   Receiver - Could not read the address header information.

4. "In Care Of not sent, incorrect Password."

   Transmitter - Incorrect password, cannot send the In Care Of envelope.

5. "Communication Error (5)."

   Receiver - Could not read the file header information.

6. "Communication Error (6)."

   Transmitter - Could not send the envelope header information.

7. "Communication Error (7)."

   Transmitter - Could not send the address header information.

8. "Communication Error (8)."

   Transmitter - The receiver did not send a confirmation header.

9. "No Connection Made."

   Transmitter - Could not connect to the AppleFax station (did not answer the phone.)

10. "Error on disconnect, file transfer was completed."

Both - Error occured while disconnecting, file transfer was completed o.k.

11. "Communication Error while sending File."

Transmitter - Error occurred while sending a file.

12. "Could not Poll - Incorrect Password or Communication Error"

Transmitter - Could not do a poll because of an incorrect password (or error during poll communication.)

13. "Communication Error (13)"

Receiver - Could not read end of envelope information.

14. "Communication Error while receiving a Fax."

Receiver - Error occurred while receiving a fax from a fax machine.

15. "Transmission/Reception aborted by the user."

Both - User aborted the transmission/reception.

16. "There was a time out during fax transmission".

Transmitter - A time out occurred during the transmission, i.e. fax machine did not answer phone, fax machine did not respond in alotted time, or transmission took too long and fax machine hung up.

17. "A communication error occurred during fax transmission"

Transmitter - An error occured between the modem and the fax machine.

18. "The device called was incompatible with the fax modem."

Transmitter - The device called was not a fax compatible device.

19. "Error during fax transmission"

Transmitter - Reported for any misc. errors that occur during fax transmission.

20. "Not enough memory to continue reception"

Receiver - If there is not enough memory to create necessary data structures during reception, this error is reported.

21. "Fax File Conversion - disk is full."

Receiver - This error occurred during fax file conversion.

22. "Fax File Conversion - low memory."

Receiver - This error occurred during fax file conversion.

23. "Fax File Conversion error."

Receiver - Some error occurred during fax file conversion.

24. "Fax receive temp file disk full error."

Receiver - This error occurred during fax file reception.

25. "Fax receive temp file disk error."

Receiver - Some error occurred during fax file reception.

Activity Report Errors for Files:

1. "Communication Error (1)."

Receiver - Could not read file header information.

2. "No Disk Space to Save File."

Receiver - There is not enough room to save the file to be received.

3. "Communication Error (3)."

Receiver - Could not read the file data header.

4. "Communication Error (4)."

Receiver - Could not read the EOF header for the file.

5. "Communication Error (5)."

Transmitter - Could not send file information header.

6. "Communication Error (6)."

Transmitter - Could not send file data header.

7. "Receiver has no Disk Space to Save File."

Transmitter - The receiver has no room to save the file to be sent.

8. "Communication Error (8)."

Transmitter - Could not send file EOF header.

9. "Communication Error (9)."

Transmitter - Receiver did not respond during the file transmission.

10. "Could Not Send this File."

Transmitter - File could not be sent.

11. "Could Not Find this File."

Transmitter - File could not be found.

12. "File Error (12)."

Both - Could not close the file.

13. "File Error (13)."

Both - Could not delete the file.

14. "Communication Error (14)."

Transmitter - Receiver did not respond during file transfer.

15. "Could not Fax this File."

Transmitter - Error occurred while sending this file to a fax machine.

16. "No contents were received for this file."

Receiver - The file was received with no data (contents).

17. "Read/Write error for the file."

Both - Error occured during a read or write to the file.

18. "Cannot create file - volume is locked."

Receiver - File could not be created, the volume was locked.

19. "Sender could not find this file."

Receiver - The sender could not find this file.

20. "Could not open new file."

Both - Error when opening the file.